ELECTRICAL REVIEW

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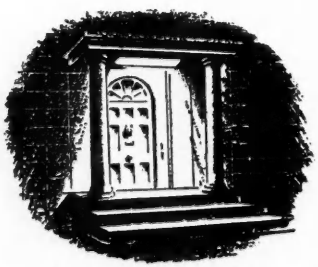

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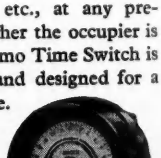

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ELECTRICAL REVIEW

Vol. CXLVII No. 3796 25TH AUGUST, 1950

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

Continuity of Supply

THE ECONOMICS OF RELIABILITY

THE engineering function of obtaining a correct balance of standing and running charges to yield the lowest overall cost for given conditions has always been subject to the need to secure reliability in operation. In public electricity supply a proper appreciation of reliability as a duty to consumers has perhaps tended to obscure its importance as a major item in production costs. The latter aspect, however, is now receiving more attention, no doubt partly as a consequence of the present generating plant stringency.

Equivalent Additions

Recently the Minister of Fuel and Power referred to the improvement in coal quality during the last couple of years as equivalent to the addition of 250,000 kW of power station plant. This figure is in line with our own earlier estimate of 350,000 kW saved on account of a reduction in the incidence of breakdowns over the winter peak period.

Although capital charges on "involuntarily idle" plant (last year more than a million kilowatts) represent a serious financial loss, apart from the cost of repairs, they may be considerably less than the loss incurred through its non-operation. The output of large modern generating units put out of commission has to be made good by running more numerous older and less efficient smaller units for longer periods. Within two or three weeks, perhaps, the additional cost of fuel may exceed capital charges on the modern plant for the whole year.

So many variations enter into the equation that no ready-made formula (such as one linking lost running hours with thermal efficiency) seems applicable, but an approximation made by Mr. R. H. Coates (Controller, B.E.A. Southern Division) at the World Power Conference provides a convenient illustration of the order of things. Having regard to the shape of the daily load curve and the wide band that separates the most and least efficient stations, his suggestion that for the best plant 1 per cent greater availability is worth 1 per cent in efficiency seems reasonable. On that reckoning the advantage of, say, ½ per cent gain in efficiency would be wiped out by one breakdown lasting ten days once in seven years.

Extent of Experiments

Nevertheless considerations of reliability should not divert attention from the necessity of going ahead with advanced designs and of avoiding the danger of over-insurance in this respect. The place of experimental plants was defined by Mr. J. N. Waite (Controller, London Division) during a discussion on high-pressure stations at the Institution of Mechanical Engineers, when he urged that they should form a relatively small proportion of the total until it had been

conclusively proved that they had as high an order of availability as existing plants. This should be no discouragement to progress, since it is not to be doubted that initial difficulties with developments that have survival value will be overcome after a short experience, as they have hitherto. Although with isolated operation some engineers "burned their fingers" through being slightly in advance of their time, a virtue of interconnected, co-ordinated operation is that any temporary setbacks of this kind are by no means so serious in their consequences. The intention of the B.E.A. to "make haste slowly" by building experimental stations of a limited number seems most likely to reconcile future economy with reliability.

THE SEATTLE TENDERS

For the second time the municipal authorities of Seattle, Washington, have declined to accept a British tender for transformers although they were offered at a much lower price than those of an American concern. This time the reason given is that the delivery period is too long. On the previous occasion it was stated that the transformers did not comply with American specifications and that the makers were too remote to be able to give the necessary service. The decisions of the Seattle authorities do not appear to have the approval of the Marshall Aid administration, however good the reasons for rejecting the tenders may have been. From the national point of view it is encouraging to know that British electrical manufacturers can underquote the Americans in their own market but this is poor consolation for the company which has unsuccessfully put so much effort into this attempt to reduce the "dollar gap."

INDUSTRY AND REARMAMENT

It would seem as though the talks which Mr. Gaitskell, Minister of State for Economic Affairs, has had with representatives of employers and trade unions have been of a general character. Mr. Gaitskell dealt broadly with the probable effect of the diversion of industry to rearmament upon production for civil purposes and for export. Further and more detailed discussions are to take place later. Unofficial (but doubtless inspired) reports indicated that the Government would endeavour to disturb the existing pattern of industry as little as possible, relying on the surplus of labour which is becoming available in some of the "development areas." There is expected to be a sufficiency of raw materials to meet the extra demand but machine tools and plant may have to be imported from the United States. The extent to which our export trade will be curtailed is said to depend upon the American contribution to our expenditure. A great deal also depends upon the possibility of increasing the output per head in which great scope still exists—largely by industrial electrification.

LARGE "ORDER"

Last week there appeared in the daily Press reports of a £54,000,000 South African "order" much of which, it was indicated, would be placed with British manufacturers. This sum, in fact, represents the total prospective capital expenditure on all works to which the South African Electricity Supply Commission is committed, and on projected schemes, which will, of course, be spread over a number of years. Much of the money will be spent on civil engineering work in connection with the construction of new power stations and transmission lines, and some of the equipment will come from the industries which have been set up in the Union. The main requirements from overseas are likely to be generating plant and boilers, of which Britain remains the chief supplier. Last year, in spite of pressing home needs, generating plant to the value of £640,000 was shipped to the Union compared with £442,000 in the previous year, and in the first half of this year the total was £345,500.

"ELECTRICAL WHO'S WHO"

Brief biographies of about 2,600 leading men and women in all branches of the industry appear in the "Electrical Who's Who." Copies are obtainable from the *Electrical Review*, Dorset House, Stamford Street, London, S.E.1, or from booksellers, price 12s. 6d. (postage 7d.)

Control in Generating Stations

2.—*Analytical Approach to Integral Design of Station Control*

By W. SZWANDER, Dipl. Ing. (Warsaw), A.M.I.Mech.E., M.I.E.E.*

THE functioning of a generating station can best be represented by a chain of interlinked and interrelated flows. To start from the end delivering the product, the flow of power depends on associated flows of coal, ash, air, water, steam, auxiliary power, auxiliary materials, human activity, etc. Incidentally, to consider the requirements and the mutual relationships of all such individual flows is a very convenient method of general approach to the design of a generating station. It ensures the most logical, clear and compact layout and it helps all the time to preserve the correct order of importance of various aspects as well as to achieve the desired degree of co-ordination among them. The obvious task of station controls is to ensure at all times, both in normal operation and during disturbances, the correct inter-relation between various flows necessary to achieve the highest efficiency with reliability and safety. The characteristics of individual flows and the requirements for their control are reviewed hereunder.

Disregarding the present-day temporarily abnormal conditions, with associated widespread measures for load restriction, the load which has to be carried by an electricity supply system is, in principle, entirely outside the control of the power supplier. It depends on a number of factors which can be only approximately predicted; thus the electric power-flow from a generating station constitutes the primary independent variable which determines all the other flows in the station. Strictly speaking, this is quite correct only in respect of an isolated station carrying its own load. When several generating stations are working in parallel on a common system it is the system load-dispatcher (operating either in one of the generating station control rooms, or in a separate system control room) who is responsible for the amount of load allocated to each individual generating station. Due to the uncon-

* Chief technical assistant, Belfast Corporation Electricity Department.

Part I appeared in the *Electrical Review* dated 11th August, 1950.

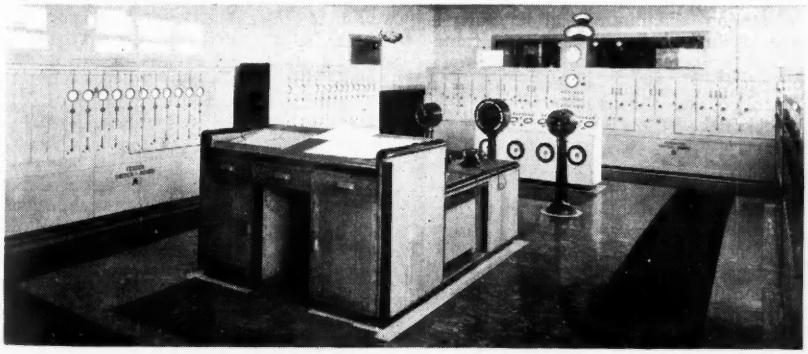


Fig. 7. Typical modern generating station control room (A. Reyrolle & Co., Ltd.)

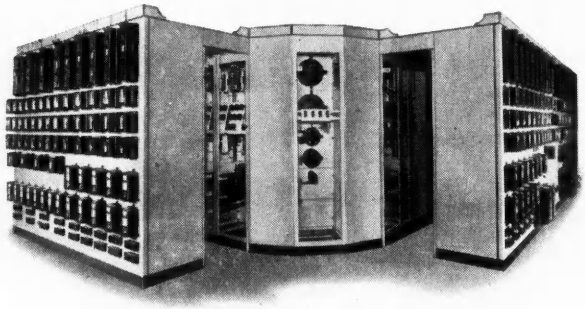


Fig. 8.—Relay panels at the back of control-room panels, corridor type arrangement (English Electric Co.)

trollable magnitude of the total system load, however, the load variations of a particular station resulting from the instructions of the load-dispatcher, hence more or less predictable in advance, will have superimposed on them additional fluctuations caused by the unexpected changes of the total system load. As a result of the load-dispatcher's action, the base-load stations will have steadier loads than the peak-load stations, but swings of system frequency and outages of station plant and transmission elements can always produce unexpected transient (or lasting) changes of load, even in the base-load stations. Thus, even in the case of generating stations connected to large power systems it is correct to regard the station load as the independent variable.

Control of Main Power-flow

Main electric power-flow originates in the station generators and, depending on the station diagrammatical layout, is directed through various busbars, transformers and reactors towards the outgoing feeders at one or different voltages. Control consists of switchgear control, the object of which is to have at all times the necessary circuit elements in service, to isolate when necessary various elements for overhaul and inspection, to satisfy at all times through suitable switching the requirements (if any) of system short-circuit power limitation, to provide at all times the necessary system-neutral earthing conditions, etc.

Switchgear control is associated with supervision and the keeping in working order of the corresponding protective gear for all elements of the electric circuits. Further, operating conditions of various items of electric plant must be supervised (e.g., winding temperatures of generators and transformers, tuning accuracy of arc-suppression coils, when used, etc.) as well as the correct operation of auxiliary plant associated with the electrical installation (generator fans, transformer oil coolers, switchgear air compressors, station storage batteries, etc.). In the majority of cases some amount of control and/or supervision of the distribution system supplied from the power station constitutes also a part of the main electric power-flow control.

The station control room (Figs. 7 and 8) is the place from which the majority of the described functions are supervised and/or carried out. In stations working in parallel with others through a superimposed primary transmission or interconnection system any particular station may be called upon to control, in part or in whole, that interconnecting system as well as to act as a load-dispatching centre for all, or for a part, of the stations feeding the system. Control of the main electric flow covers also voltage control of the delivered power as well as of the reactive power provided when more than one station supplies the system (only control of reactive-load sharing between the various generators, in the case of an isolated station), while both excitation control of generators and operation of tap-changing gear of transformers are involved. When automatic voltage regulators are used their manual adjusting, in most cases, is required to ensure working to a prearranged programme of voltage levels. Finally, the whole range of power and energy metering must also be men-

tioned, covering all needs from producing data for the internal use of the supply undertaking, for supervision of the station and distribution system efficiency, to the main metering equipment required for accounting purposes when an exchange of energy between the station and the system takes place on a commercial basis.

Steam-flow Control

Fluctuations of the main electric power represent the load variations on the turbines driving the generators; hence steam flow through the turbines must be controlled accordingly, which to a large extent is achieved automatically by the governors. Safety is additionally ensured by the provision of separate overspeed governors. Deliberate independent intervention in the control of steamflow through the turbines is necessary on account of the need to influence the load-sharing between the various sets working in parallel; also to control the system frequency and the synchronous-time accuracy. Influencing of loadsharing may be required at times of starting and stopping the individual machines and also continuously during total-load changes, if the governor characteristics do not ensure equal load sharing at all times, or if economic considerations require certain definite departures from load sharing as would result from the action of the governors only. Frequency and time control are separate complex problems. Load control of a generating station, a problem closely associated with that of frequency control, arises only when more than one station is feeding the system. In such cases the steam flow through all the turbines of a station is controlled to meet the system load-dispatcher's directions as to the total power output of the station at a given time.

The steam flow through a particular turbine is supervised, to check the correct performance of the machine, by watching pressures and temperatures at various stages, including (the most important) the condenser vacuum. Turbine gauge boards accommodate the necessary instruments (Fig. 9). Tapped-off side flows of steam through feed-heaters, etc., are mostly controlled automatically by the rate of feed-water flow, but the putting in and out of commission of the individual feed-heaters, etc., constitutes a part of the steam-flow control. Before the main steamflow reaches the turbine stop valves its path is controlled through various parts of the live steam pipework: steam receivers, headers, by-passes, interconnectors, with associated valves; here steam is branched-off to such steam-driven auxiliaries as boiler feed pumps, live steam evaporators, steam ejectors, etc. Steam flow originates in boilers and proper boiler control is responsible for their output matching at all times the demand by the main turbines, plus that of other auxiliary steam-operated appliances.

Steam pressure is the criterion of the balance between steam generation and steam demand. Apart from pressure constancy, which is required to maintain the best turbine efficiency, steam temperature (the degree of superheat) must be closely controlled and is also a part of

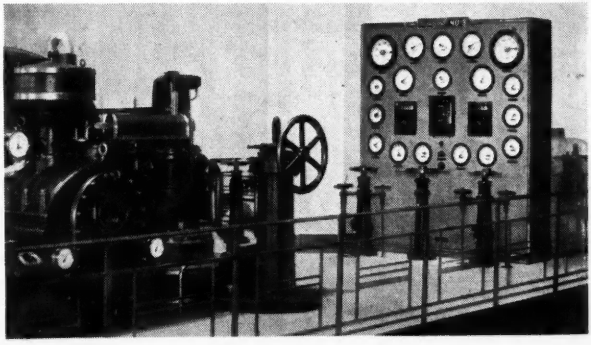


Fig. 9.—Turbine gauge board near the steam end of a generating set (George Kent, Ltd.)

boiler control. Finally, in stations using the reheating cycle the control of secondary superheating, or of reheating, represents an additional complication of the steam-flow control. It would be more correct to talk in the preceding about "heatflow" instead of the steamflow, the former being the form of energy that is converted in the turbo-generator into electric energy. With a reasonable degree of constancy of steam pressure and of temperature, however, the two flows are equivalent, so the steamflow is usually measured and referred to.

The regulation of turbine-oil flow is a part of turbine control. In normal service the correct operation of oil coolers, the temperatures of the main bearings, the pressure of oil supplied to the governor must be supervised. When starting and in emergencies, alternative oil pumps have to be brought into operation.

It is not the general practice to control quantitatively the circulating-water flow for maintaining the optimum condenser vacuum, though schemes promising definite economic advantages have been suggested in which speed control of c.w. pumps is proposed with a view to reducing the cooling-water flow, hence the power required to operate the pumps, to the minimum necessary for maintaining a satisfactory vacuum in the condensers. With a common pump house and c.w. pressure range, the joint output of all pumps in service must be lined up with the requirements of all the running turbines, allowing adequate standby of course. Additional items subject to control are screens, penstocks, valves controlling alternative routes of c.w. flow, cooling towers and their sources of make-up water, chlorination plant and boosting pumps, as and when any of these items are provided.

The rate of flow of fuel into the boiler furnaces must roughly follow the fluctuations of the steam demand. There is no strict proportionality between the two because the boiler efficiency is not constant, depending on load and on combustion efficiency. A time lag is also present between variations of the fuel input into the furnace and the boiler steam output. The task of boiler control is, first, to meet the steam demand and, secondly, to achieve it in the most efficient way; hence boiler and combustion control are inseparable. Boiler control boards (Fig. 10) assemble the majority of instruments and control devices necessary for those purposes. Fuel-flow control, so far as it is a component of general boiler control, deals with the fuel input to the furnaces. In the case of p.f.-fired boilers the control of unit-type pulverizers (mills) with associated feeders, exhausters or primary air fans, classifiers or separators is also a part of the boiler control.

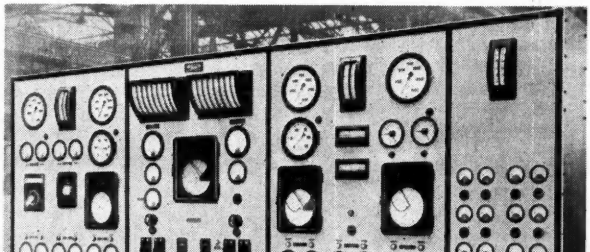


Fig. 10.—An example o a modern boiler control board for pulverized fuel boiler (Metropolitan Vickers Electrical Co.)

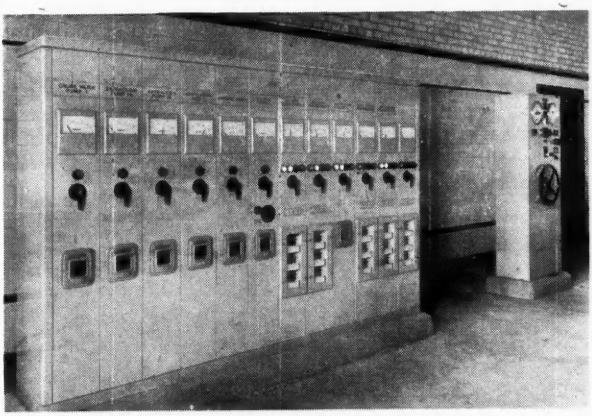


Fig. 11.—Auxiliary switchgear control panel (unit board) in a modern power station (General Electric Co., Ltd.)

Ahead of the boilers, fuel-flow control includes the whole handling installation in which, in the case of coal, the following stages can be distinguished: unloading of coal from railway wagons, barges, etc., crushing of coal, weighing, transporting by conveyors, storing coal, the drag-scraper installations and bulldozers for reclaiming it.

Control of combustion-air and fire-gas flows is an inherent part of boiler control. Forced and induced draught, secondary and tertiary air fans have their outputs controlled by various methods. Dampers have to be operated to provide alternative paths for air and gas flows. Also, the temperatures of combustion air and of coal-drying air for the pulverizers must be controlled.

Continuity of ash removal must be maintained at an approximately proportional rate to that of coal flow towards the furnaces. In ash-handling, two stages can always be distinguished: one is continuous, or high-frequency periodical, carrying ash away from the boilers to some storage hoppers or, with a wet process, settling ponds, while the second stage is that of actually removing ashes from the station site. Control is needed of all kind of conveyors or pumps.

Some form of flue-gas cleansing being usual in modern stations, continuous supervision of grit arrestors, dust precipitators, or washers is necessary, the flow of dust and grit being more or less proportional to the rate of station loading. With the large variety of types of equipment used, control problems are multiple. Also, soot-blowers and vacuum plants for the conveyance of dust fall into this section. Disposal of dust from p.f. station, as distinct from ash disposal, and flue-gas washing to precipitate sulphuric acid from the products of combustion represent special problems, but their control should be grouped with dust and grit-flow control.

Feed Water Control

On the one hand, turbine control covers the extraction pumps, feed heaters, deaerators, bled-steam evaporators and unit surge-tanks. On the other hand, boiler feed pumps, the whole feed-water pipework with all its alternative circuits, feed regulators, reserve tanks and chemical injection equipment are all within the scope of boiler control. In some cases it is difficult to draw accurately a line of demarcation. In modern high-pressure installations a considerable saving of auxiliary power can be made by using automatic speed-control of b.f. pump motors. When reciprocating pumps are used, adjusting their speed is the only possible method of controlling the feed-water flow. Just as steam pressure and temperature are critical for the operation of turbines, so feed-water temperature and boiler water level are critical for boiler operation. Control of boiler make-up water flow covers evaporators, storage tanks, chemical water treatment plant, etc.

In the control of auxiliary electric

power flow two spheres can be distinguished. The first concerns switchgear, auxiliary generators (house or shaft generators) and transformers, their control being performed from a number of auxiliary switchboards, or preferably from a central board for the auxiliary system in or near the station control room. The second sphere is the auxiliary power utilization, consisting mainly of motor starting facilities (Fig. 11) and motor speed controls; this is frequently an inherent part of the control of various other flows.

Flow of auxiliary materials is mentioned for the sake of completeness, though it is rather a matter of routine organization of supplying lubricants, firebricks, cleaning materials and spare parts. Control covers purchasing, storekeeping and handling.

It may appear odd, but it is nevertheless important to include the human element. Control in this connection means administration of operational shift work, maintenance and management. Here belongs the keeping of technical records, evaluation of current results of operation, the chemical laboratory, office accommodation, communication between various parts of the technical equipment, etc.

National Gallery Improvements

GALLERY XXIX at the National Gallery, London, has now been equipped with an air-conditioning plant and concealed fluorescent lighting, thus making it one of the most advanced of its kind in Europe. This scheme was designed and supervised by the Ministry of Works.

The plant is housed at the rear of the West Wing and provides clean air which is stable in temperature (65 deg F) and in relative humidity. This renders the glazing of old paintings unnecessary and allows the use of far stronger illumination as well as reducing fatigue to visitors, a great problem in museums generally. The engineering costs of the plant amounted to £15,000, but it has sufficient capacity to serve a further five galleries. Furthermore, it is estimated that the cleaner and more consistent atmosphere will add hundreds of years to the life of pictures.

The gallery has been provided with a 21ft-high glass ceiling, in the centre of which is a rectangular arrangement of louvres concealing five continuous lines of fluorescent lamps. These are of the type used for colour matching and comprise 28 40 W tubes and 58 80 W tubes, the total loading of the installation, including control losses, being about 7.2 kW. During the daytime a certain number of lamps are switched on to cancel out the small amount of shadow caused by the louvres. With all the lamps on at night the measured illumination in the centre of the gallery 5ft from the floor is 20 lumens, while at the same height on the walls it is 15 lumens.

The principal contractors for the lighting installation were the Berkeley Electrical Co., Ltd., and for the air-conditioning plant the Norris Warming Co., Ltd.

Fluorescent lighting at the National Gallery

VIEWS on the NEWS

By REFLECTOR

THE recent announcement by London Transport that the Kingsway Tunnel will become redundant on completion of the conversion of the tramways to bus operation has led people to conjecture what will happen to the tunnel afterwards. One suggestion which has been put forward is that it should be used as some sort of arcade. The awkward approaches and sharp bends present a difficulty, otherwise I should think that an underground car park would be about the most useful application.

★ ★ ★

It may interest readers to know how the tunnel originated. According to a history of the project by C. S. Dunbar, the idea of such a link between the northern and southern tramway systems was first discussed in 1898, following the decision to clear part of Holborn for the construction of Aldwych and Kingsway. As first built the subway was designed for single-deck vehicles only, and the initial section was put into service on 24th February, 1906, when trams ran from the Angel, Islington, to Aldwych. Construction of the 620ft long twin tunnels connecting with the Embankment was completed by 1908, when through services began on 10th April. In 1930 the tunnel was closed for reconstruction to take double-deck trams, being reopened on 14th January, 1931.

★ ★ ★

Last year it was reported that experiments were being carried out in the reclamation of low-lying land on which power-station ash had been deposited. In one example quoted the cost worked out at £80 per acre, including £14 for fertilizers, seeding and cultivation, £45 for soil spreading and transport, and £21 for fencing, etc. The *Farmer and Stock-Breeder* records another experiment of this kind on land between Portishead and Clevedon, which before being covered with ash was largely peat bog. The total cost is given as about £12 per acre, no mention being made of soil covering. Cattle were turned out on the ashes as soon as the seed had sprouted, thus helping to provide extra consolidation. I gather that the experiment shows every sign of being successful, though it will take some years before the results can be fully assessed.

★ ★ ★

Mr. C. T. Melling, chairman of the Eastern Electricity Board, is to play the rôle of Daniel at the first post-war meeting of the Council for the Preservation of Rural England at Tunbridge Wells in October. He has undertaken to address the conference on the problems of rural electrification but there is comfort in the assurance of a C.P.R.E. official, quoted by the *Manchester Guardian*, that the gatherings are "not for thumping on the table or hurling brickbats at our enemies." But, of course, the Council should not look on the Electricity Boards in that light. Rural England benefits from their work which they carry out with as little disturbance of scenic values as possible.

★ ★ ★

There is an addendum to my last week's note on the exhibition of lighting by W. E. Staite in Manchester in 1850. Mr. G. F. Staite, his last surviving grandson, writes to the *Manchester Guardian* referring to a forecast made by his grandfather in the preface to his papers which are preserved at the Institution of Electrical Engineers—"One hundred years hence when the electric light shall have largely superseded other systems of illuminating, which I feel convinced it must do in the end. . . ." But he could have had little idea of the forms of electric lighting, from filament to fluorescent, which followed the arc lamp, and fulfilled his prophecy.

PERSONAL and SOCIAL

News of Men and Women of the Industry

WE are informed that **Mr. V. P. Pennell,** A.M.I.E.E., charge engineer at the Upper Boat (Pontypridd) power station of the B.E.A., has been appointed power station superintendent by the Douglas (I.O.M.) Corporation. **Mr. C. E. King,** at present at Hackney power station, has been appointed shift charge engineer.

Mr. J. P. Huggard has been appointed chief designer in the Engineering Department of the General Electric Co., Ltd., at Witton, in succession to Dr. R. G. Jakeman whose retirement was announced in our issue of 28th July. Mr. Huggard studied electrical engineering at the Royal College of Science, Dublin University, where he obtained his Associateship and the B.Sc. (London) degree. He was also awarded an industrial bursary by the Royal Commissioners for the 1851 Exhibition. After serving an apprenticeship with the Lancashire Dynamo & Motor Co., Ltd., he joined the design staff of the G.E.C. in 1924, and nine years later was promoted to the position of senior electrical designer in charge of the section handling large a.c. and d.c. machines. Mr. Huggard is an associate member of the I.E.E. and for many years worked closely with Dr. Jakeman.

Mr. J. P. Huggard

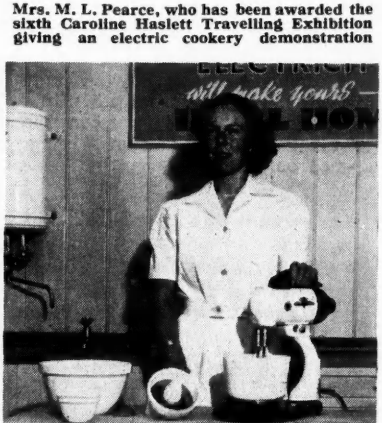
Mr. V. Easton.

Mr. V. Easton has recently joined the Engineering Department of the Witton Works, of the General Electric Co., Ltd., as project development engineer. Mr. Easton was trained at Faraday House and in 1925 was awarded the gold medal as the best student of his year. A year later he obtained a degree in engineering from London University, and then joined the Heaton Works of C. A. Parsons & Co., subsequently being transferred to the electrical design section. In 1935 he was promoted to the senior staff to supervise the design of d.c. and a.c. machines, and to handle special technical problems, such as the design of switchgear-testing alternators. In 1943 he read a paper on this subject before the I.E.E. of which he is an associate member.

Mr. E. E. Scrivener, whose retirement for health reasons is announced by E. K. Cole, Ltd., joined the company in 1927. He was the company's first representative and "manned" the stand at the first National Exhibition at the Albert Hall. Originally his area covered the Southern Counties but as the company's business expanded his activities were later mainly confined to Surrey, Sussex and Hampshire. Mr. Scrivener will be succeeded in his territory by **Mr. J. W. Oldfield.**

In our last issue we reported that **Mrs. M. L. Pearce,** senior housecraft adviser in the Bristol Sub-Area of the South Western Electricity Board, is going to France as the sixth holder of a Caroline Haslett Travelling Exhibition. Mrs. Pearce has been a demonstrator for E.D.A. and for electricity

Mrs. M. L. Pearce, who has been awarded the sixth Caroline Haslett Travelling Exhibition giving an electric cookery demonstration



undertakings in different parts of the country, including Sussex, Wales, the Isle of Wight and Norfolk. She took up her present appointment with the South Western Electricity Board in 1949. In the accompanying picture she is seen giving one of her demonstrations.

Mr. H. C. L. Douthwaite has been appointed assistant branch manager to the Birmingham Branch of Z Electric Lamp & Supplies Co., Ltd. Previously he served with the British Thomson-Houston Co., Ltd., in the Derby-Nottingham area.

Mr. N. Marsden, export manager of Henry W. Peabody & Co., of London, is making an extensive tour in Brazil, Argentina and Uruguay. He is leaving on 26th August and will be away for two or three months.

Sir John Kennedy, whose visit to Uganda was delayed through illness, leaves for Kampala on 1st September, where he will be acting chairman of the Uganda Electricity Board until Mr. Westlake's return on 19th October. Mr. Westlake sailed to America on 23rd August and returns to London on 4th October.

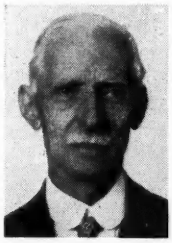
Mr. R. S. Mayers has retired from C. M. Churchouse, Ltd., with whom he has been senior representative for many years, and to mark his retirement a presentation was recently made to him by Mr. C. M. Churchouse on behalf of the company.

At the second annual golf competition at Stoneham in aid of the **I.E.E. Benevolent Fund,** organized by Mr. W. P. Conly, M.Sc., M.I.E.E., local hon. treasurer, members and friends came from the whole of the Southern Centre, stretching from Weymouth to Brighton, and the weather was excellent. The chairman of the Southern Centre, Mr. R. H. Coates, B.Sc. (Eng.), M.I.E.E., presided over the meeting and was accompanied by Mrs. Coates, who presented the prizes. The winners were: 18-hole medal competition, for handicap 15 or under: First prize, Mr. J. B. Bradford (68 net); second prize, Mr. R. L. Gamble (73 net). Over 15 handicap: First prize, Mr. W. G. Maddock (75 net); second prize, Mr. R. Coombes (77 net). Cup presented by Pirelli-General Cable Works, Ltd., for I.E.E. member with best score: Mr. W. G. Murdoch. 18-hole four-ball "better ball" competition under handicap against bogey: First prize, Messrs. A. E. McCabe and W. G. Murdoch (9 up); second prize, Messrs. A. J. Oliver and R. Morgan (6 up). "Bogey" cup, presented by the chairman, Mr. R. H. Coates: Messrs. E. McCabe and W. G. Murdoch. 18-hole putting competition: D. S. Allom and G. Plant tied (32).

Mrs. Coates presenting the bogey cup to the winners, Messrs. E. McCabe and W. G. Murdoch at the recent I.E.E. Golf Competition.

OBITUARY

Mr. Francis Lydall, the well-known consulting engineer, died at Oatlands Park Hotel, Weybridge, on 15th August, in his seventy-eighth year. Mr. Lydall devoted his whole life to the electrification of railways in which he had a world-wide reputation. Before the 1914-18 war he was on the manufacturing side with Siemens Bros. & Co. and Siemens Bros. Dynamo Works, and during that war he was attached to the Ministry of Munitions as principal assistant to Colonel W. McLellan, the first Director of Electric Power Supply. In 1917 he joined Merz and McLellan, the consulting engineers, of which he became a partner in 1927. He formally retired only eighteen months ago but as their consultant continued to take an active part in the firm's work. He was particularly responsible for the two most extensive main line railway

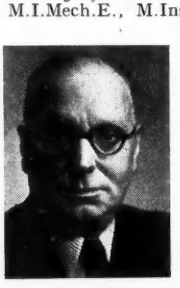


The late Mr. F. Lydall

electrifications in the Commonwealth—from Glencoe to Pietermaritzburg in Natal, and that from Bombay over the Western Ghats. He visited India many times between 1917 and 1948, during which he made many reports for the Railway Board and advised several of the Provincial Governments on their post-war electrification plans. He also made several visits to South Africa and up to the time of his death was still a partner in Merz and McLellan (India) and in Merz and McLellan (South Africa). Within the last few weeks he had been advising the Railway Executive on questions involving the future of railway electrification in Great Britain.

Mr. Lydall was educated privately and afterwards at King's College, London, and St. John's College, Cambridge, taking his B.Sc. degree in London and his B.A. in Cambridge, where he was thirteenth wrangler. In collaboration with the late Professor E. Wilson of King's College he wrote what was for a long time the standard textbook on electric traction. He also contributed many papers to various technical institutions and scientific bodies. He was a member of the Institution of Electrical Engineers and of the Institute of Transport and served on their respective Councils.

Mr. A. C. Baker.—The death occurred on 22nd July of Mr. A. C. Baker, C.B.E., M.I.Mech.E., M.Inst.T., A.M.I.E.E., general manager of the Birmingham City Transport Department. Mr. Baker was educated at Cranleigh School, Surrey, and Nottingham University and served as a pupil with Dick Kerr & Co. He joined the City of Birmingham Transport Department in 1908 as assistant engineer and held this position until 1921, when he became chief engineer of the City Transport Department. He was appointed general manager in 1928. In 1942 he was president of the Municipal Passenger Transport Association, of which he became hon. treasurer in 1946. He had been leader of the employers' side of the National Joint Industrial Council for the Road Passenger Transport Industry since 1946.



The late Mr. A. C. Baker

Mr. G. H. H. Lawrence, general sales manager of the Refrigeration Division, Pressed Steel Co., Ltd., Cowley, died suddenly on 5th August, following a short illness, aged forty-two. Mr. Lawrence joined the company as manager of the Manchester branch in 1942, transferring to the head office at Cowley as service manager, and in 1948 he was appointed general sales manager. The funeral took place on 10th August at Elmers End Cemetery, Beckenham, and amongst the mourners were a large number of senior executives of the Pressed Steel Co., including Mr. M. A. H. Bellhouse, assistant managing director, and Mr. E. G. Rowledge. Also present were Mr. E. G. Batt, director of the British Refrigeration Association, Mr. C. M. Marks, representing Prestcold distributors and other representatives of the refrigeration industry.

Mr. E. Powell.—The death occurred on 11th August at the age of fifty-nine of Mr. E. Powell, who directed the business of E. Powell, Ltd., electrical contractors of Tunbridge Wells. Mr. Powell was educated at Judd School, Tonbridge, and served during the 1914-18 war in the Army Service Corps workshop. He was an active member of the Tunbridge Wells Branch of the Electrical Contractors' Association. His father, who is over ninety years of age, although retired, still calls at the business premises of the firm.

Mr. E. S. Broadhead, M.I.C.E., died in hospital on 19th August. He was chief designer for the J. L. Eve Construction Co. and was responsible for many interesting designs including the Forth, Clyde, Cart and Tay River crossing towers for the Central Electricity Board, the 350 ft radar towers for the Air Ministry, the reinforced concrete flat slab warehouse for Falk, Stadelmann & Co., Ltd., and many radio towers for the B.B.C.

Mr. A. D. Church.—The death has occurred in Jamaica, at the age of forty-nine, of Mr. Alfred Derek Church, M.I.E.E., A.M.I.I.A., assistant manager of the Public Service Co., Ltd., Kingston, Jamaica, and late engineer of the Fens Sub-Area, Eastern Electricity Board. We hope to deal more fully with Mr. Church's career in our next issue.

WILLS

Mr. D. Wilson, O.B.E., A.M.I.E.E., F.Inst.F., retired engineer, general sales manager to Babcock & Wilcox, Ltd., and later with International Combustion, Ltd., who died on 19th May last, left £7,424 gross (£6,427 net).

Mr. C. C. W. Stoodley, general works manager of the Hotpoint Electric Appliance Co., Ltd., Peterborough, who died on 13th May intestate, left £10,096 gross (£6,143 net).

Mr. R. S. Whaley, chairman and managing director of Speedy & Eynon, Ltd., British Electric Co. (Beco), Ltd., and Engineering Services, Ltd., who died on 4th September, left £24,511 gross (£7,722 net).

Control Room Lighting

Installation at Walsall Power Station

UNUSUAL features characterize the new lighting installation in the control room of the Walsall generating station planned by the Benjamin Electric, Ltd., in conjunction with the chief generation engineer (construction), Midlands Division, British Electricity Authority, and installed by France's Electric, Ltd.

In this case it was possible to undertake the lighting design work at a sufficiently early stage to enable arrangements to be made with the control panel manufacturers to provide a continuous recess in the top horizontal plates of the panels to house the lighting reflectors so that they were entirely screened from view.

The chief generation engineer decided that tungsten lamps should be used in preference to fluorescent lighting in view of their greater reliability under low voltage conditions and the facility for placing part of the installation on the emergency changeover circuit. He stipulated that no fittings, pendant from the ceiling, or otherwise, were to be visible.

Therefore wholly indirect lighting was used, provided by Benjamin standard R.L.M. "Crysteel" vitreous enamel reflectors with dustproof "visor" covers to prevent ingress of dirt.

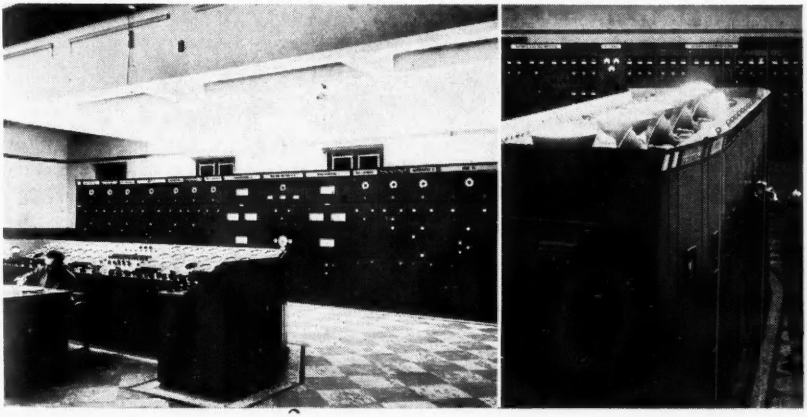
This illumination was so graduated that the brightness of the room unoccupied by panels at the ends was reduced to provide a region where the eyes could be rested from the higher brightness of the panels and by ensuring that the centre lines of the panels were not directly under the beams, a certain shadow component was developed which broke up the monotony of a ceiling of uniform brightness.

Two major requirements in control room lighting are the avoidance of reflections of the light sources in the glass fronts of the instruments and of shadows cast on the dials by the rims of the instruments.

The centre of the ceiling of the control room is broken by a large lantern for the admission of daylight. This area is dark at night and from the normal viewing position this dark area is "imaged" in the instrument dials, thus providing a maximum comfortable visibility.

To raise the brightness of the ceiling in front of the panels, Benjamin "Projectolux" units were installed. For the illumination of the panels at the far end of each side, "Anglite" corner troughs were concealed behind the beam. To illuminate the control desks under the lantern "Projectolux" units were installed at the apex of the lantern, thus avoiding any image of these units in the main control panels.

Left: Indirect lighting of main panel at Walsall power station with control desk lighted by fittings concealed in roof lantern. Right: Method of installing the fittings in recesses on top of the panels



Submarine Cable Centenary

Science Museum Exhibition

ON Monday next (28th August) it will be just one hundred years since the first submarine telegraph cable was laid across the Straits of Dover by J. W. and Jacob Brett.

To celebrate the centenary and to demonstrate the facilities for world-wide communication which are now available through the network of submarine cables, a special exhibition is to be opened on Monday at the Science Museum, South Kensington, by Mr. Ness Edwards, the Postmaster-General. This exhibition has been organized by the Science Museum with the co-operation of the General Post Office, Cable and Wireless, Ltd., Western Union Telegraph Co., the Telegraph Construction and Maintenance Co., Siemens Brothers and Co., and the Institution of Electrical Engineers.

The laying of the first primitive submarine cable in 1850 and the subsequent early Atlantic cables will be illustrated and the growth of the comprehensive cable network described. The development of submarine cables throughout the century will be outlined, with exhibits of equipment and methods employed in cable manufacture, laying and repair. A feature of the exhibition will be the working exhibits and it will be possible to witness the transmission of messages to overseas destinations and the reception of replies within a few minutes.

A Useful Survey

A booklet entitled "100 Years of Submarine Cables," prepared by G. R. M. Garratt, M.A., M.I.E.E., of the Science Museum, and published by H.M. Stationery Office, price 2s 6d, will be on sale at the exhibition. It traces the history of submarine cables from 1850 to the present time and also includes a chapter on future trends. Although prepared for publication to coincide with the exhibition, this 59-page survey will be of value as a work of reference. There are chapters dealing with the manufacture and development of cable and terminal equipment and cable laying and cable-repair ships.

The exhibition will be open to the public, admission free, from 29th August to 28th October.

"Telcon" Celebrations

A closely allied centenary celebration which is to take place during the same week, having been deferred from 1945 owing to war conditions, is that of the "Telcon" organization. Lord Colgrain, the chairman, who can claim a family connection with the firm since its inception, has arranged an attractive programme, including an "open day" for guests at Telcon Works, Greenwich, and a centenary dinner at the Dorchester Hotel.

The Telcon organization includes the Telegraph Construction and Maintenance Co., Ltd., whose forerunner the Gutta Percha Co., which was formed in 1845, made the original Dover-Calais cable. In 1935 the organization's submarine cable interests were merged with those of Siemens Brothers and Co., Ltd., by the formation of Submarine Cables, Ltd.

The record of the Telcon organization shows a continuous and successful use of new methods of insulation, armouring and manufacture, and the development of new types of cable. The simple copper conductor covered with gutta percha which linked France and England a century ago has now become a complex cable such as the semi-air-spaced coaxial submarine telephone cable between this country and Belgium which is capable of taking as many as 240 telephone conversations simultaneously.

In 1949, 3,500 miles of submarine cable was made at Telcon Works and the total output of Submarine Cables, Ltd., and its parent companies since Telcon produced the first successful Atlantic cable in 1866 amounts to nearly half a million nautical miles, which is said to represent 90 per cent of world production.

"Public" Lighting

Impressing Visitors to Next Year's Festival

By J. M. WALDRAM, B.Sc., F.Inst.P., F.I.E.S.*

THE term "public lighting" should mean any installation which is not private. We have generally assumed it to mean principally the lighting of public streets; but that is too narrow a view. All the artificial lighting which we meet from the time we leave home in the morning until we return there in the evening is "public" lighting—the bus, the tube train, the office, the factory, the restaurant, the library, shop windows, shops, streets, signs, floodlighting, the cinema, the stage, the churches. For our visitors, it means almost all the lighting they see; they see more than we do of the lighting of our ships, docks, trains, aircraft, airports and hotels.

We hope soon to welcome very many visitors of whom many are coming for the first time. They will have varying ideas of this country and not all will be admirers. First impressions die hard. Those of us who have been abroad will recall the curiosity with which we crowded forward on the boat for the first sight of a new land and how we noted details of everything we saw on the first day. Docks and customs; the first train or taxi journey; the first hotel; the first daring walk alone; the quizzical appraisal of the shops. They will be doing that to us in ten months' time and saying: "So this is England!" What they see, and their impressions of what they see, will depend very much upon how things are lighted.

We have a great deal to be proud of in our record of lighting achievement. We originated in this country many of the lighting devices which are used all over the world. Gas lighting began here; so did the electric arc. We ran America a dead heat for the filament lamp; we had the first public installation of street lighting by electric discharge lamps, using the high-pressure mercury discharge which we first brought to practical development. We had 2,500 miles of this lighting before the war—far more than any other country. The fluorescent lamp started here and, even when we had been surpassed by the Americans in its production, we produced new phosphors which gave it half as much light again. We made the biggest artificial light source ever produced by man. In the technique of lighting it is more difficult to be specific; but it could be said fairly that whereas the Americans excel in manufacture and the French in æsthetics, we excel in understanding.

Attention to Detail

But these are not the things which visitors see; certainly not what they see first. Bad lighting is often more conspicuous than good lighting—often it is bad because it is conspicuous. The few carefully thought-out, unobtrusive and effective lighting installations are shouted down by thousands of careless, dazzling and garish examples, installed in ignorance and crying our vulgarity to the world. If Great Britain is to give a good impression in 1951, it will be done not only by the special and lavish lighting of show places, but even more by our attention to detail in the places where we are not "on show" at all. Just now we cannot afford extravagance either in capital expenditure or in energy consumption and ostentatious installations would be a mistake; but good lighting is not extravagant. "The engineer is the fellow who can do for one dollar what any fool can do for two"—and the currency in the proverb is significant. It is our chance to show that economy does not involve gloom.

It is specially to be hoped that those who have charge of our public services,

* Past-president, Illuminating Engineering Society, London. The author is with the Research Laboratories of the General Electric Co., Ltd., Wembley.

now the property and responsibility of all of us, will see to it that they set an example. Docks, airports and railways are the first contacts which our visitors make, and they meet them when they are tired and sometimes ill from travelling and worried with the ordeals of customs and currency. I still remember the impression I received, when travelling in Europe before the war, on crossing between two European countries, at a railway station which on the one side of the frontier door was clean, nicely decorated and well lighted, and on the other side of the door was dirty, gloomy and inefficient. Docks and railways are not easy to make attractive, but it can be done, as it has been at the Gare Maritime at Le Havre since the war. Good dock lighting and decoration puts "Welcome" on the mat.

Floodlighting Methods

It is a long time since we had the chance of floodlighting our buildings and lighting our shop windows and we are out of practice. Yet before the war we were quite good at floodlighting and we possess buildings of ancient dignity and interest in all our cities, the floodlighting of which is the simplest and most effective way of making them attractive and emphasizing their beauties.

The best of floodlighting is that, given a fine building, it is usually easier to create a good effect than a bad one. One has to be particularly crass to make a good building look ugly, or in bad taste—though it can be done. Given a reasonable æsthetic sense and some engineering ingenuity, buildings can be revealed in a beauty that even daylight cannot surpass and the cost, in relation to the effect produced, is surprisingly small. Good floodlighting is not a matter of kilowatts, but of getting light on to the right building from the right direction. In most cases it does not require an extravagant amount of light. Here the Swiss and the French have some lessons to teach us which we shall do well to heed; they have achieved some very beautiful results with long-range floodlights, giving careful and coherent angle lighting.

It is to be hoped that there will be some intelligent selection of buildings to be floodlighted. Even if all our buildings were beautiful—and we have some which no art of lighting can redeem—it would be pointless to light them all in a futile competition which would benefit nobody. Good floodlighting needs darkness as well as light; it would be poor taste to crab a fine effect with sideshows. The City Fathers and the Chamber of Commerce will need to get together if our cities are to be well shown and their beauties unspoiled.

On a smaller scale the same applies to show window lighting. The best display is not made by cramming the window with goods and the best lighting is not done by cramming it with lamps. Some of the most effective lighting in the displays of the most exclusive stores on Fifth Avenue, New York, is done at quite low levels of illumination with only six or eight spotlights—but they are in the right places. We have goods to sell which we can be proud of and we can light them better if we use taste and skill rather than luck and load. The interior of the shop need not make the mistake of some American installations, where all form and modelling is blotted out by an expensive deluge of light; good lighting calls for emphasis in the right places, and emphasis is impossible if the illumination is the maximum everywhere. A more modest general installation, with emphasis on special displays using, for example, some reflector lamps, may be far more effective.

Adequate Hotel Lighting

There is a special responsibility on those who light hotels and restaurants. Some visitors may like the impersonal gorgeousness of American hotels, while others will prefer the glamour of the Continent, and the good restaurateur generally knows his business. Most visitors probably like to feel that they are being personally looked after and to get the impression of a welcoming table and a bedroom in which they feel at home. Additional local lighting, or even table lamps and floor standards, can be used to give a local emphasis which formal lighting often lacks, to brighten the linen and silver and to make hotel lounge chairs cosy and intimate.

We need to give attention to maintenance. Some of our cities are old and dirty beyond any chance of renovation, but the city lighting departments usually do much to brighten them by being

punctilious in the maintenance of the street lanterns. Sparkling glassware gives an alert appearance to any city; dirty fittings make everything drab and proclaim laziness. Nothing is so conspicuous as the gap-toothed look of a failed lamp, in any installation, interior or exterior. The more sleek the design the more carefully must the gear be looked after; for if a lamp fails the installation looks half undressed at once.

We have been learning lately about the partnership of lighting and decoration. There is a lot of dingy paintwork which has had to wait its turn ever since the war; lighting will show it up and it will make the light glaring. There are some colours, too, which seem rather out of temper with fluorescent lighting. But often a coat of paint is nearly as good as a new lighting installation and it can make new lighting even better. Paint consumes no watts, but it can make the watts we consume vastly more effective. We might well be bolder, too, in our use of vivid colour.

The Dutch set us an example; their country is flat and could be uninteresting, but they have a way of enlivening it by boldly painting such things as the window shutters and barge-boards of their houses, and street lanterns, in a fresh and cheerful scarlet or orange.

We have in the Illuminating Engineering Society in Great Britain a body which is exceeded in age and members only by the American Society, and in merit by none. Its interests are wide and its members include almost all those who are concerned with any branch of lighting. The Society, both as a body and through its members, will do all in its power to make a success of the Festival of Britain so far as lighting can do it. It has recently inaugurated a Register of Lighting Engineers, on which are inscribed the names of those members who are adequately qualified to give technical advice. Its *Transactions* contain authoritative papers and discussions and contributed articles, while its journal, *Light and Lighting*, records recent interesting lighting installations and ideas from all over the country and abroad. But it will need more power than the Society alone can muster if we are to be ready for our guests in 1951. It is to be hoped that everyone in the electrical industry and outside it will do what he can to clean up the little, bad installations and to show what can be done economically with taste and ingenuity combined.

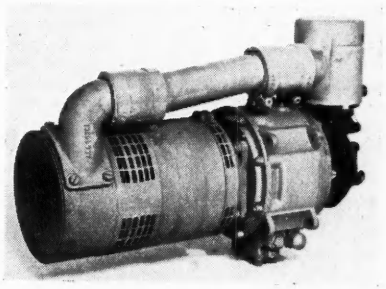
Compressor for Jet Aircraft

IN co-operation with the English Electric Co., Ltd., the Hymatic Engineering Co., Ltd., has developed an electrically driven compressor unit for use in jet aircraft where no direct mechanical drive from the gas turbine installation is available. A considerable saving in weight has been obtained by dispensing with the usual heavy engine-driven gearbox and by providing instead a drive to an electric generator capable of supplying the aircraft's auxiliaries. Despite the additional electric motors required by this system, the weight reduction remains appreciable.

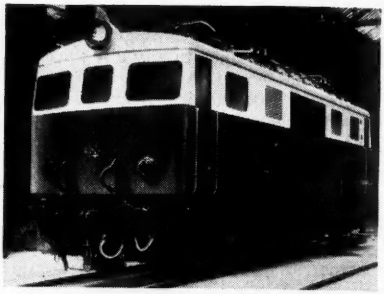
Actuated by this generator, the unit, Hymatic Type EMC1, consists of an English Electric 0.9 h.p., 9,500 r.p.m., 24 V motor which drives a standard Hymatic compressor through a reduction gearbox with a ratio of 7.25 to 1. The compressor provides generating pressures of up to 600 lb/sq in, at which point it delivers 1.25 cu ft of free air per minute.

Lubrication for the compressor is of the dry sump type and is provided by a forced oil supply from pumps and tank housed in the reduction gearbox. Current drawn by the unit ranges from 30 A at zero pressure to 44 A at 600 lb/sq in. A further series of electrically driven units providing pressures of 1,000 lb/sq in is now being developed, and these will be available with an alternative a.c. motor operating on a 200 V 400 c/s three-phase supply.

Hymatic EMC1 electrically driven compressor unit



Locomotive for Portugal



Mixed traffic electric locomotive for the Estoril Electric Railway, Portugal

DELIVERY has been made by the General Electric Co., Ltd., to the Estoril Electric Railway, Portugal, of a 1,500 V d.c. mixed traffic locomotive for service on the 5ft 6in gauge line from Lisbon to Estoril and Cascais. This locomotive is part of an order which also included motor coaches and trailers for passenger service (see *Electrical Review*, 28th April, 1950, page 817) and is required for hauling passenger trains of 240 tons or goods trains of 600 tons on the Lisbon-Cascais line at maximum speeds of 50 m.p.h. and 30 m.p.h. respectively. The mechanical parts were built by the North British Locomotive Co., Ltd.

The locomotive has the Bo+Bo wheel arrangement, the tractive and braking forces being transmitted through an articulated pin connection between the bogies.

Two air-operated pantographs are fitted, each with its own roof-mounted isolating switch; only one need be used in normal service, but they may be operated together for working heavy loads.

A main isolating switch is provided inside the h.v. compartment, with its operating handles outside the corridor. When it is operated the pantographs are lowered, the 1,500 V circuits are earthed, and the safety locks on the h.v. compartment door are released, permitting access from the side corridor.

Two axle-hung traction motors are mounted in each bogie, and drive the axles through single-reduction gearing with a ratio of 67:16. Forced ventilation is provided by a blower in the machinery compartment, part of the output from which is used for cooling the starting resistances. Both motors in each bogie are permanently in series, and control is effected by series or parallel connection of the pairs through a system of electro-pneumatic contactors. At 750 V the full field one-hour rating is 270 h.p. and the continuous rating 210 h.p. With weak field the corresponding ratings are 280 h.p. and 220 h.p.

All the auxiliary machines are housed in a compartment adjacent to No. 1 driver's cab. They comprise a 1,500/110 V motor-generator set for control and lighting supplies; a G.D. Peters motor-compressor set for the Westinghouse brakes on the locomotive, the electro-pneumatic contactors, pantograph operation, sanding and horn; a Westinghouse exhauster for vacuum braking on the train; and a blower to supply cooling air for the motors and resistances. All these machines operate at 1,500 V d.c. The blower motor is started by the same contactor as the motor-generator, but the latter can be isolated by a switch in case of emergency to allow the blower to be operated independently. A 110 V battery carried in the underframe floats across the generator output and supplies all the locomotive lighting when the m.g. set is not running. The coach lighting is fed from the generator over jumper cables between the vehicles. The construction of all auxiliary machines is similar and, in fact, many of the parts are identical, thus facilitating maintenance.

In the cabs, all the instruments are grouped in a desk form of structure at the front, with the master controller and brake controls to right and left respectively of the driver's tip-up seat. The controls are arranged for easy manipulation whether the driver is seated or standing. The cab equipment includes electric windscreen wipers and speedometers as well as the usual meters.

Maltese Project

IT was announced last week by the Economic Co-operation Administration Mission to the United Kingdom (E.C.A.) that Marshall Plan funds to the extent of $2,300,000 have been earmarked for the construction of a new power station on the island of Malta. The capacity of the plant would be between 15,000 and 18,000 kW, with provision for a further 5,000 - 6,000 kW. The scheme would facilitate industrial development, so helping to redress the present unfavourable balance of trade and solve the unemployment problem.

Reversing D.C. Motors

Methods With Different Machines

BY "ROTOR"

THE torque created in a d.c. motor is due to the reaction between the armature conductors and the field system. The direction of torque can, therefore, be changed by reversing either the direction of the armature current or the magnetic polarity of the field magnets. In some instances a d.c. machine is required to work partly as a dynamo and partly as a reversible motor. It is advisable to change the rotation of such a machine by reversing the armature connections with the object of maintaining the field poles at constant magnetic polarity. This assists in preserving the residual magnetism so that the dynamo will always build up with the same terminal polarity.

A double-pole two-way switch may be used to reverse either the field current or the armature current, but care must be taken not to interrupt the shunt field circuit while it is carrying current because a high voltage may be induced in the coils and break down the insulation. In some small series motors the armature is connected between two sets of field coils; in this case the simplest method of changing the direction of rotation is to reverse the armature current (Fig. 1). It should be noted that if the leads to the brushgear are long and flexible the motor can be reversed by moving the whole brushgear round through approximately one pole pitch, without breaking any connections. This has the same effect as reversing the connections to the brushes.

Commutation Correction

Because the brushes of a non-interpole motor are generally set slightly back from the neutral position to assist commutation, this should be compensated for when reversing a d.c. motor otherwise there may be sparking or abnormal speed variation after reversal. This means that if reversal is effected by moving the brushes round in the opposite direction to the original rotation the reversal may require less brush movement than one pole pitch, while if the brushes are moved in the other direction slightly more movement may be required.

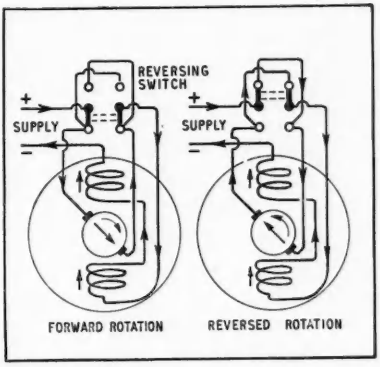


Fig. 1.—Reversing a series motor by changing the direction of the armature current

Where interpoles are fitted each should have the opposite magnetic polarity to the next main pole forward in the direction of rotation. Thus the current through the interpoles may need reversal when changing the direction of rotation. Since the interpole coils are connected in series with the armature, the armature and interpole coils should be treated as one unit; it is only necessary to open the connection between the armature and interpole coils when the motor is reversed by moving the brushgear. It follows that reversal of a series-interpole motor may be carried out by reversing the connections to the field coils, by reversing the connections to the armature plus interpoles, or by moving the brushgear through one pole pitch and reversing the connections to the interpole coils alone.

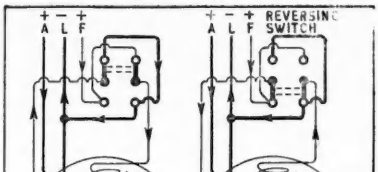


Fig. 2.—Double-pole two-way switch for reversing a shunt-interpole motor by the reversal of the field current

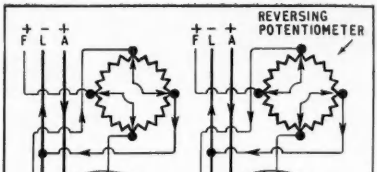


Fig. 3.—Potentiometer regulator for the purpose of reversing and controlling the speed of a shunt-interpole motor

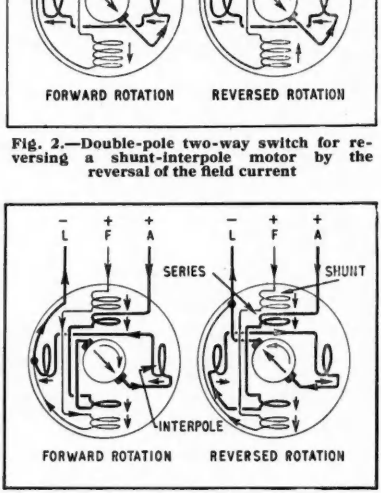


Fig. 4.—Reversal of the direction of a compound-interpole motor by reversing the armature and interpole coil connections

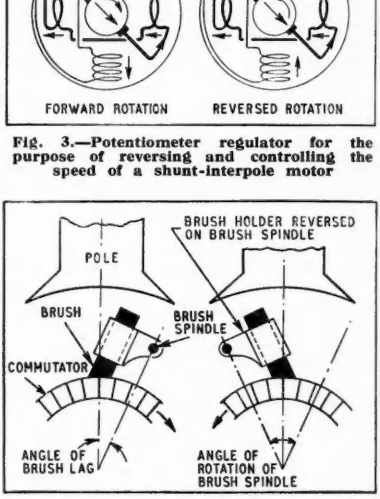


Fig. 5.—Movement of non-radial brushgear for producing reversed rotation

To reverse a shunt motor the field coil connections may be reversed; alternatively the connections to the armature plus interpoles (if fitted) may be reversed; or the brushgear may be moved approximately one pole pitch and the connections to the interpole coils reversed (Figs. 2 and 3).

It is important that the relative polarities of the series and shunt field coils of a compound motor shall be kept the same when reversing, otherwise the starting torque and speed variation on a varying load will be changed. Thus a compound motor may be reversed by reversing the connections to the series field coils and to the shunt field coils; changing the connections to the armature plus interpoles (if fitted); or moving the brushes and reversing the interpole coil connections (Fig. 4). A double-pole two-way switch can, of course, be used to reverse the connections to the armature circuit if frequent reversal is required. It will be seen from Figs. 1 to 4 inclusive that the connections give the required conditions for reversal, i.e., reversal of either the armature current or the field current; in all cases the interpole polarity is opposite to that of the next pole forward in the direction of rotation.

Brush Position and Bearings

It should be remembered that the brushes of an interpole machine are set almost exactly in the neutral position and thus will not require alteration on reversal, from the point of view of commutation. Interpole motors are therefore much better than non-interpole motors

or reversing duty, as the correct brush position for the latter depends on the direction of rotation. In some motors the brushes are not radial to the commutator and these may tend to chatter after reversal. This can be overcome by reversing the brush holders on their spindles (Fig. 5).

If the motor has no interpoles the position of the brush spindles may require little or no alteration after reversing the rotation and reversing the brush holders on their spindles. It is also wise to examine the oil rings of the bearings after reversal to ensure that slight lack of symmetry of the oil ring slots in the bearings does not result in the oil rings sticking. The radial air gap clearance between the armature and field poles may also alter after reversal if the bearings are worn.

In some cases "plugging" can be carried out with a shunt or series motor, i.e., the motor torque can be reversed by changing the armature connections while the motor is still revolving in the original direction. In order to limit the current taken by the armature and the volt drop across the commutator, under these conditions, a resistance should be connected in the armature circuit while the motor is slowing down during braking. The motor applies a considerable braking torque while the momentum of the drive carries the armature round in the opposite direction to its torque; thus a motor which is used in this way requires a strong shaft and efficient means of securing the armature core to the shaft. If plugging is required merely for the purpose of stopping the motor quickly a relay should be provided to switch off the motor as it comes to rest and before it reverses.

BUNKER LEVEL CONTROL

A BUNKER level control unit has been developed and is now being made by Radiovisor Parent, Ltd. This simple unit, which is quickly and easily screwed into position, incorporates a projecting rod-type electrode which may be of any length to suit the requirements of the installation. It is electrically connected to a neat control unit comprising a single-stage thermionic valve amplifier incorporating red and green lights and terminals for connection to an external audible alarm.

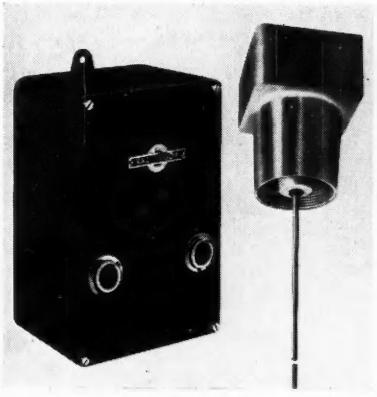
One interesting application of this equipment is for controlling the level in bunkers holding coarse, crushed silica stone, the moisture content of which varies up to 15 per cent. When damp, this material sticks to glass with great tenacity, so the use of ordinary photo-electric methods is not possible because of obscuration of the glass windows. For this reason, the Radiovisor BL49 control was chosen.

The material is stored in a twin-bunker fed from a common chute having a two-way outlet which, by movement of a plate valve, can be arranged to discharge into either bunker. Two 12 in electrodes, one in the top of each bunker, are connected to a common control panel.

Except when the bunker is full, a green light shows on the control panel, indicating that filling can proceed. However, when the material level rises until it touches the electrode, a circuit is completed, thus closing a relay and causing a red light to show. At the same time, the motor responsible for feeding the material to the chute is automatically stopped, and an audible alarm sounded to attract the attention of the operator.

Although not fitted to this particular plant, the control system could be extended so that, as the material is drawn off and the level falls, it uncovers a second electrode. When this occurs, the motor would be restarted to refill the bunker. A somewhat similar unit is also being installed for controlling the level in bunkers used for the storage of fertilizers.

Radiovisor bunker level control unit



NEW BOOKS

Principles of Television Reception. By A. W. Keen. Pp. 319; figs. and index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 30s.

This book contains a very complete and practical description of the fundamentals of television, is well written, clear and easy to understand, and the bibliography has been carefully chosen to enable the earnest student to proceed to a more expert knowledge of a particular aspect.

Of course, the writer of a technical book about such a rapidly growing subject as television is always in danger of his book being out of date before it is published, or at any rate soon afterwards. This is probably most true of a book dealing with its subject in a general way, because it is exceedingly difficult to avoid being topical. The book is, perhaps, a little out of date, but not too much, and without finding anything specifically inaccurate, it seems that the author is not very strong on the American television position; the information presented appears to be third or fourth hand. The appendices are unnecessary and the mathematics in Appendix I could with advantage have been included in the chapters concerned. Appendix II does not mention the articles on television in the *Journal* of the I.E.E.

Nevertheless, this TV textbook, whilst not perfect, can be recommended as the best British effort since the end of the war.—J. E. C.

Basic Electricity for the Million. By L. Houldridge. Pp. 94; figs. 49. Crampton & Son, Ltd., Sawston, Cambridge. Price 6s.

Books of the "Electricity-for-Beginners" kind vary in style from the purely descriptive on the one hand to the academic school primer on the other. Mr. Houldridge has attempted to steer a middle course and to combine a thorough explanation of simple basic quantitative principles with a certain amount of popular descriptive matter.

Starting with current and e.m.f. as fundamental concepts, Ohm's law, electrical power, and the heating, chemical and magnetic effects of electricity are then explained, and illustrated by a large number of simple numerical examples. There is some good descriptive matter on electric heating and on electromagnetic induction, and the work ends with a list of formulæ and excerpts from the Tables of the I.E.E. Wiring Regulations.

The author's aim is praiseworthy, but he has achieved only partial success; the numerical examples seem to obscure rather than bring out and show the beginner the connection between the basic electrical units and energy or capacity for doing work that is the saleable utility of an electricity supply. The author, for instance, uses the phrase "quantity of electricity in Board of Trade Units" on p. 18, and a little further on we find the abbreviation "B.O.T. Unit" instead of kWh. Again, in the section on electric heating, the numerical connection of the joule and the kWh is nowhere explicitly stated. The book would have been improved by the provision of an index.—G. W. S.

Books Received

Progressive Mathematics. By P. Clyne. Pp. 270; figs. 121; index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 15s.

Arc Welders' Tables and Data. Edited by A. J. Coker. Pp. 144; figs.; index. George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Price 5s.

Book-keeping and Accountancy for Private Companies. (4th Edition). By Owen J. West, F.C.A., F.C.I.S. Jordan & Sons, Ltd., 116, Chancery Lane, London, W.C.2. Price 10s 6d.

Resistance Welding in Mass Production. By J. Hipperson and T. Watson. Pp. 278; figs. 228; index. Published for *Welding* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, E.C.1. Price 21s.

Etude Electromagnetique Général des Machines Electriques. By R. Langlois-Berthelot. Pp. 284; figs. 187; index. Eyrolles Editeur, Paris.

Applied Electricity. By Edward Hughes. Pp. 412; figs. 269; index. Longmans, Green & Co., Ltd., 6 & 7, Clifford Street, London, W.1. Price 10s 6d.

OVERSEAS ELECTRICAL TRADE

High Level of Exports Maintained in July

JULY'S total of exports of electrical apparatus and machinery was almost the same as that for June—£11,294,324 compared with £11,279,548. This was £2,075,941 more than in July last year, the improvement being largely confined to goods and apparatus, exports of which rose from £5,527,640 to £7,265,401. An interesting feature of this advance is the growing European trade, practically every country increasing its purchases. Particularly good results were obtained in Sweden, £225,954 compared with £96,614; Denmark £430,949 (£60,686); Holland £244,270 (£104,168); France £167,144 (£46,784); Portugal £179,509 (£45,802); Austria £87,213 (£11,773); and Greece £99,093 (£45,142).

Elsewhere, compensating for declines in purchases by South Africa (from £1,000,990 to £578,637) and India (from £444,998 to £388,145), there was an increased volume of trade with Australia (from £531,143 to £983,375), Canada (from £54,501 to £195,331), British East Africa (from £50,259 to £131,214), Malaya (from £112,798 to £262,556), Egypt (from £138,668 to £202,311) and Burma (from £41,432 to £82,224).

Turning to individual classifications, there was a big demand for the somewhat erratic item "submarine cables," exports of which were £385,081 higher at £425,475. Shipments of other types of cable were around the same level as in July last year, Australia

TABLE I.—ELECTRICAL EXPORTS

Class	July, 1950	July, 1949
	£	£
Telegraph and telephone cables and wires (submarine)	425,475	40,394
Ditto, not submarine	658,316	621,386
Wires and cables, cotton, silk or artificial silk insulated	34,738	39,551
Ditto, enamel, glass or asbestos insulated	66,048	75,304
Ditto, paper insulated	387,189	616,207
Ditto, rubber insulated	332,415	281,689
Ditto, other	130,730	83,516
Commercial radio apparatus	448,314	280,599
Domestic radio apparatus	234,377	233,822
Telegraph, telephone and signalling apparatus	1,489,515	1,080,841
Radio loudspeakers	42,289	16,127
Sound reproducing apparatus, components and parts other than cinematograph apparatus	425,801	193,942
Other sound reproducing apparatus	87,260	36,864
Radio valves	249,405	100,288
Electric lighting carbons	19,682	9,592
Lamps not exceeding 24 V	34,564	21,730
Discharge lamps	28,820	30,524
Other lamps	72,508	57,924
Other lighting apparatus	312,524	357,607
Primary batteries	164,461	79,209
Parts other than carbons	28,034	4,459
Accumulators for motor vehicles	175,291	131,109
Ditto traction	6,016	7,867
Ditto radio	1,392	4,786
Other portable accumulators	50,552	72,506
All other accumulators	18,630	28,059
Parts and accessories	75,616	62,441
Cooking appliances	113,660	120,766
Heating appliances	48,785	47,431
Parts and accessories for cooking and heating appliances	48,488	35,142
Flat irons	47,103	23,062
Commercial electrical instruments	106,000	61,947
House service meters	76,302	117,594
Time recorders and time switches	17,748	4,256
Other electrical instruments	104,992	55,037
Electro-medical apparatus (not X-ray)	44,275	22,520
X-ray apparatus, tubes and parts	71,446	33,198
Permanent magnets	19,935	12,321
Insulating cloth and tape	80,573	53,997
Other insulating materials	80,537	60,968
Unclassified electrical goods and apparatus	405,595	311,058
TOTAL electrical goods and apparatus	7,265,401	5,527,640
Generators, up to 200 kW	595,239	682,346
Ditto, over 200 kW	313,720	429,748
Ditto, parts	308,350	83,614
Motors, railway and tramway	6,600	23,549
Ditto, other, not over ¼ h.p.	86,657	69,164
Ditto, over ¼ h.p. but under 1 h.p.	29,998	35,003
Ditto, from 1 h.p. to 250 h.p.	367,741	478,747
Ditto, over 250 h.p.	68,397	68,706
Ditto, parts	77,140	74,415
Converting machinery	16,010	1,894
Transformers, including coils	682,057	528,392
Rectifiers for power house use	69,887	17,991
Motor starting and controlling gear	148,129	154,716
Switchgear and switchboards (not telegraph or telephone)	818,283	795,197
Other electrical machinery	25,877	21,591
TOTAL electrical machinery	3,614,085	3,465,073
Vacuum cleaners and parts	241,454	94,150
Other electrically operated portable appliances	95,834	93,351
Portable electric tools	77,550	38,169
GRAND TOTAL	11,294,324	9,218,383

being the best customer. Substantial buying by France (£93,362) and Sweden (£87,577) helped to raise the value of exports of commercial radio apparatus from £280,599 to £448,314: sales of domestic radio apparatus,

TABLE II—DISTRIBUTION OF ELECTRICAL GOODS AND APPARATUS

Destination	July, 1950	July, 1949
	£	£
Channel Islands	32,843	29,833
Malta and Gozo	24,286	13,017
Cyprus	11,494	14,125
British West Africa ...	118,817	89,602
Union of South Africa ...	578,637	1,000,990
Northern Rhodesia ...	47,980	22,529
Southern Rhodesia ...	81,193	88,566
British East Africa ...	131,214	50,259
Bahrein, Koweit, Qatar and Trucial Oman	27,441	42,694
India	388,145	444,998
Pakistan	272,872	265,418
Malaya	262,556	112,798
Ceylon	55,546	50,478
Hong Kong	96,045	99,864
Australia	983,375	531,143
New Zealand	268,964	220,044
Canada	195,331	54,501
British West Indies ...	97,782	106,408
Anglo-Egyptian Sudan ...	47,393	18,165
Other Commonwealth Countries	78,369	30,868
Irish Republic	284,696	173,350
Soviet Union	30,296	24,112
Finland	35,321	22,252
Sweden	225,954	96,614
Norway	94,274	158,720
Iceland	5,688	36,851
Denmark	430,949	60,686
Poland	16,959	25,323
Germany	22,820	7,028
Netherlands	244,270	104,168
Belgium	85,976	48,787
France	167,144	46,784
Switzerland	30,666	27,233
Portugal	179,509	45,802
Spain	9,648	20,109
Italy	38,119	12,751
Austria	87,213	11,773
Hungary	8,613	15,395
Czechoslovakia	3,125	17,128
Greece	99,093	45,142
Turkey	28,917	89,080
Indonesia*	20,407	61,201
Netherlands Antilles ...	6,206	8,615
Portuguese East Africa ...	4,823	167,378
Syria	16,718	48,098
Lebanon	19,603	45,878
Israel	34,281	22,043
Egypt	202,311	138,668
Arabia	8,794	25,355
Iraq	34,791	35,517
Iran	94,615	101,689
Burma	82,224	41,432
Thailand	15,994	18,668
China	1,056	3,787
United States of America	61,715	17,328
Mexico	1,813	12,424
Colombia	14,458	33,158
Venezuela	62,457	54,550
Chile	14,881	5,210
Brazil	210,533	141,278
Uruguay	17,700	9,202
Argentine Republic ...	263,753	75,912
Other Foreign Countries ...	146,735	84,861
TOTAL	7,265,401	5,527,640

* Includes Netherlands New Guinea in 1949.

which have shown a tendency to fall during recent months, recovered slightly from £233,822 to £234,377.

Though not so high as in June, overseas business in telegraph and telephone equipment at £1,489,515 was £408,674 above the July, 1949, figure, Australia (£469,118) being easily the largest buyer with Portugal next (£146,892). An increased demand for valves from £100,288 to £249,405 is mainly attributable to bigger buying by unspecified Empire and foreign countries.

Despite a reduction from £88,213 to £29,141 in purchases by South Africa, exports of cooking and heating appliances as a whole rose from £203,339 to £210,993. At £47,103 the value of electric irons dispatched was more than doubled. Substantial orders from Russia valued at £22,801, with increased buying from Australia (£35,945 compared with £12,426), were largely responsible for a rise from £238,834 to £305,042 in shipments of electrical instruments. More than twice as much electro-medical and X-ray apparatus was exported.

Machinery Exports

An especially encouraging feature of the electrical machinery market was the buying by Canada of £111,074 worth of generating plant, compared with a negligible amount in July last year. Though taking less than half the previous July's amount (£208,245 compared with £481,822) Russia still remains the biggest customer for generating plant. South Africa's share of the business was reduced from £209,513 in July, 1949, to £68,623 last month.

Motor exports were lower in value (£636,533 compared with £749,584), South Africa (£108,214) and Australia (£107,172) absorbing between them about one-third of the total. The same two countries, taking £361,036 and £229,541 worth respectively, and India (£270,790) accounted for about one-half of the exports of other electrical machinery. About three times as many vacuum cleaners were sold, valued at £241,454 (£94,150), and twice as many portable electric tools, valued at £77,550 (£38,169).

Exports to Argentina

FIGURES published in the *Review of the River Plate* (Buenos Aires) show that the value of electrical goods and apparatus shipped from this country to Argentina during the eleven months to May last was far below the amount provided for in the 1949 Anglo-Argentine agreement. The actual value was £2,370,000—about 53 per cent of the total aimed at (£4,488,000).

Commerce and Industry

Seattle Rejects Another Tender
Large Cooking Installation

IT is reported by *Reuter* that the Seattle (Washington) City Council last week passed over a tender for two transformers put in by Ferranti, Ltd., in favour of a bid by the American General Electric Co., although that company's figure was $370,000 against Ferranti's $232,800. The reason given was that Ferranti's could not meet delivery date requirements.

It was stated on behalf of the company that it was realized that the offer stood little chance of acceptance because of the short period allowed. The hope was expressed that success would be achieved with future tenders.

Earlier this year when the British company substantially underbid the American G.E. it was said that the Ferranti equipment offered did not comply with the specifications. When the city authorities invited British and other foreign firms to submit tenders for two more transformers, Mr. Paul Hendriks, city purchasing agent, announced that there would be no bar against foreign bids, but said to get the contract a firm would have to give a 100 per cent guarantee that the equipment would work satisfactorily. The equipment would also have to have standard American threads and American General Electric bushings or bushings interchangeable with them.

Seattle's policy of discrimination in favour of American firms was revoked partly as a result of a visit to Seattle by Mr. William C. Foster, Deputy Marshall Plan Administrator, who persuaded officials that the policy was not good for Seattle, whose port depended on international trade, and it would also undermine European faith in the United States policy of encouraging increased dollar exports.

Instrument Technology

The Society of Instrument Technology was established nearly six years ago. The constitution of the Council provides a balanced representation of users and manufacturers of instruments, of research and education, and of the Local Sections in Glasgow, Manchester, Tees-side, Birmingham and Cardiff. With the present issue of the Society's *Transactions* (Vol. 2, No. 1, 1950) this well-produced journal becomes a quarterly publication. It is authoritative and of great value to all concerned with instruments; it is available to non-members at 12s 6d. Information about the Society may be obtained from the treasurer, Dr. H. Moore, C.B.E., at Hill House, Seal Hollow Road, Sevenoaks, Kent.

Long-Service Battery

In February, 1927, a 224-cell Planté-type battery was installed for standby purposes by the Chloride Electrical Storage Co., Ltd., in the Bankside power station, London. It had a capacity of 4,000 Ah at the 10-hour rate of discharge to a final voltage of 1.85 V per cell and was one of the first batteries to be operated on the system of trickle charging. When it was first put into service the trickle-charge current was adjusted to 3 A, but this was found too high and it was reduced to 1 A. In March, 1928, it was further reduced to 0.7 A and this rate was maintained until October, 1949, when the battery was finally taken out of commission owing to reorganization of the power station.

The battery gave reliable service throughout the whole of its life, and only minor and easily remedied troubles were experienced. This proves that a Planté battery will operate satisfactorily and give a life well in excess of 20 years when operated under properly controlled conditions of trickle charge. It has shown that wood separators are the only components which deteriorate to any extent and these are easily and cheaply replaced. It is possible that before long separators of microporous materials will become available for stationary batteries.

This battery has also shown that, contrary to previously held theories, a Planté battery will operate satisfactorily without regular discharging and recharging, provided it is maintained on trickle charge.

Television in Brazil

Our Brazil correspondent reports that the country's first two television transmitter stations are nearing completion. Both are being built through the initiative of Mr. Assis Chateaubriand, of the *Diarios Associados* (Associated Newspapers), who own the Radio Tupi broadcasting stations. One

is being installed on the summit of the Sugar Loaf, which rises sharply to a height of 1,275 ft from the shore of Guanabara Bay, Rio de Janeiro. Four towers carry the 6,000 V transmission line to the top of the peak. The other transmitting station is being erected in San Paulo by Radio Corporation of America engineers on the roof of the State of San Paulo Bank, which, at 520 ft, is the highest point in the city. Both transmitters will have a range of 50 miles, but that in Rio will only cover the centre and south of the city, owing to the obstacles presented by the surrounding mountains. Sets will operate on 625 lines in Rio and 525 lines in San Paulo. Since the end of April no licences have been issued to import television sets, except under the "barter" system, in exchange for bananas, oranges, tea, tobacco, fibres and timber. These products can only be exported to the United States at uneconomic prices, and the difference between the foreign and home market prices, amounting to as much as 60 per cent is added to the cost of the imports.

Two other companies, Radiotelevisão do Brasil and Radiotelevisão Paulista, have been formed in Rio and San Paulo, respectively, but have not yet begun building. The former signed a contract for materials with the American General Electric, but was then unable to obtain dollar exchange from the Bank of Brazil. A new contract was then signed in London with Pye, Ltd., to supply the necessary equipment, including receiving sets.

Works Open Days

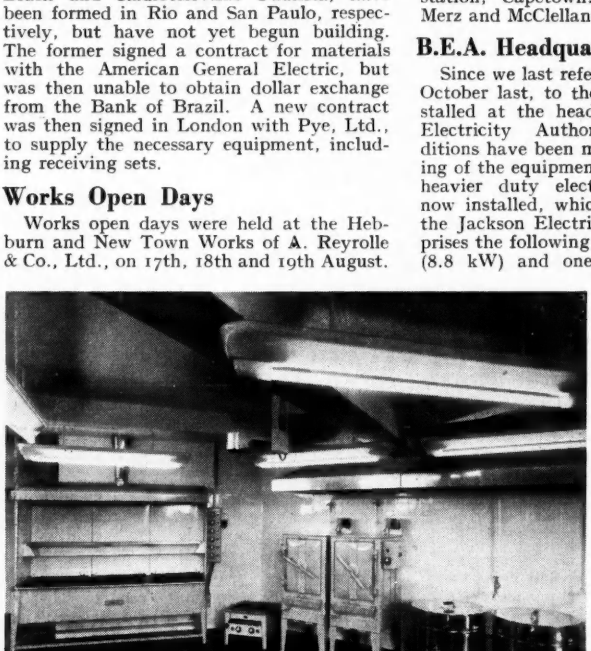
Works open days were held at the Hebburn and New Town Works of A. Reyrolle & Co., Ltd., on 17th, 18th and 19th August. Invitations were issued to all employees to bring parties of relatives or friends to visit either one or both works. About 4,000 visitors attended, and there were 300 visitors from the Bushing Co., whose works are adjacent. The visitors were conducted through the works and a number of machines were in operation with demonstrators, while a complete range of switchgear panels in the various assembly shops were erected and a number of these were in operation. A demonstration of high-voltage flashover on a 132 kV bushing with a 50 c/s supply was demonstrated, and at the short-circuit testing station a special film was shown continuously to illustrate the work in proving circuit-breaker performance.

Plant for South Africa

In connection with the £54 million power supply expansion scheme recently announced by the Electricity Supply Commission of South Africa, the Metropolitan-Vickers Electrical Co., Ltd., has on order two 30,000 kW 11 kV 3,000 r.p.m. turbo-generator sets for the Salt River No. 2 station, Capetown. The consultants are Merz and McClellan.

B.E.A. Headquarters Canteen

Since we last referred, in our issue of 21st October last, to the canteen equipment installed at the headquarters of the British Electricity Authority, considerable additions have been made, and the total loading of the equipment is now 223.7 kW. The heavier duty electric cooking equipment now installed, which has been supplied by the Jackson Electric Stove Co., Ltd., comprises the following: One 10ft hot-cupboard (8.8 kW) and one 5ft hot-cupboard (8.5 kW); two grills on floor stands (17.5 kW); two 80-kW cookers; one 3-deck pastry oven (11.8 kW); two steaming ovens (10.2 kW); one 3-pan fish fryer (24.3 kW); a 2-plate stockpot stand (5 kW); three 30-gall. boiling pans (27.6 kW); one bain marie (10 kW); and one 29ft-long hot-cupboard service counter (30 kW). In addi-



Boiling pans, steaming ovens, stockpot stand and fish fryer made by the Jackson Electric Stove Co., Ltd., in the B.E.A. h.q. canteen

tion there are preparation tables, pastry benches and stainless steel sink units (by James Farquharson and Sons, Ltd.), a crockery washing machine (by Dawson Bros.), two café sets (by Jackson Boilers, Ltd.), and a mixing machine, potato chipper, slicer and potato peeler (by Peerless and Ericsson, Ltd.), all of which have been supplied by the Jackson Electric Stove Co., Ltd. The canteen is capable of catering for between 800 and 900 people.

Disclaimer

We are asked by Clarke (Electrical) Co., Ltd., of 14-15, Sheldon Street, Paddington, W.2, to state that they are not connected in any way with E. Clarke (Electrical), Ltd., whose liquidation was referred to in our last issue.

Brush Company's Canadian Acquisition

The Brush Electrical Engineering Co., Ltd., has acquired a controlling interest in the Vivian Diesel Engine Works, Ltd., of Vancouver, British Columbia. The finance involved is of the order of $500,000 (Canadian). Mr. W. Vivian is retaining a minority interest in the company and remaining on its board. The Brush Company is lodging complete sets of drawings of all the Brush and A.B.O.E. Group's engine products and some electrical products in Canada and the Vivian factory, as well as continuing the production of the Vivian diesel engine, will be in a position to satisfy not only Canadian customers but the market throughout the Americas.

Contract Price Adjustment Formulæ

The following are the latest figures for use in the B.E.A.M.A. contract price adjustment formulæ: (a) "Rates of Pay": The rate of pay for adult male labour at 12th August, 1950, shall be deemed to be 115s (same). (b) "Costs of Material": The index figure for intermediate products published by the Board of Trade on 12th August is 287.8 and is the figure for the month of July (against 285.2 for June).

Garcke's Manual

The 1949-50 edition of "Garcke's Manual of Electricity Supply" once again presents an up-to-date picture of the electricity supply position in Great Britain and Ireland. There are three main sections. The first covers the British Electricity Authority, its Divisional organization, a list of power stations with details of plant installed, and comparative tables of station operating data. Section II deals with the Area Boards and Sub-Areas, and includes the North of Scotland Hydro-Electric Board and undertakings in Ireland, the Isle of Man and the Channel Islands. Section III is a directory of personnel. A general survey of the progress of the industry during the year includes a statistical summary based on the reports of the B.E.A., and the Area Boards for 1948-49. The new uniform bulk supply tariff operative from 1st April last is set out. A list of Government Departments concerned with the electrical industry is included, and there is also an alphabetical list of associations, institutions and societies. The Manual is published by the Electrical Press, Ltd., 23, Great Queen Street, London, W.C.2, at £3 3s net.

Electrical Commercial Travellers

A general meeting of the Electrical Trades' Commercial Travellers' Association will be held at 5.30 p.m. on 8th September at the Feathers Hotel, Broadway, Westminster, S.W.1.

Copper Price Raised

There was an increase of £16 a ton in the price of electrolytic copper from 22nd August, raising it to £202 a ton.

Lead Price Increases

The Ministry of Supply announced last week that from 16th August the price of good soft pig lead was increased by £8, from £96 to £104 per ton delivered. Early this week a further increase of £8 to £112 a ton was announced.

Industrial Finishes Exhibition

On Wednesday next the Industrial Finishes Exhibition opens at Earls Court, London, and will continue until 7th September.

The "New Australia"

When the *Monarch of Bermuda* burned out in dry dock at Hebburn in 1947 and was declared a total loss, the damage sustained by the main electrical propulsion and auxiliary services, all of which are of G.E.C. manufacture, was not by fire but by water.

The fire completely gutted the midships portion down to "D" deck but did not touch the engine room. Water half filled the main propulsion motors and submerged all the auxiliaries. The decision was made to carry out reconstruction at Southampton and after arrival and dry-docking a temporary supply of power was arranged by means of a twin cable feeding 1,400 A across the dock wall from an ex-German floating generator ship. For this purpose 500 yd of

single core 1181/.029 tough rubber cable was specially made in three weeks at the adjacent factory of Pirelli-General Cable Works, Ltd.

The ship was renamed the *New Australia* and the G.E.C., acting as sub-contractors to John I. Thornycroft & Co., Ltd., have been responsible for supervising the complete overhaul of the major items of electrical equipment originally supplied, including turbo-electric propulsion equipment, power generation equipment and auxiliaries, including marine motors of over 3,000 h.p., 410 miles of conductor and 13 lifts, 5,000 lighting fittings, telephones, cooking equipment and fire alarm system.

Trade Announcements

The London office of **Elexcel, Ltd.,** has been removed to Strowger House, 8, Arundel Street, W.C.2 (telephone: Temple Bar 9262).

The sales office of the **Aluminium Wire & Cable Co., Ltd.,** is now at 37, Thurloe Street, South Kensington, London, S.W.7 (telephone: Knightsbridge 1721).

Argosy Radiovision, Ltd., has acquired new works at Barking in which production at three former factories will now be concentrated. The address is Argosy Works, Hertford Road, Barking, Essex.

Ekco-Ensign, Ltd., has appointed Mr. A. E. Dainty as its representative for the north western sector of Birmingham, and he will be based at the company's office at 40-42, Summer Row, Birmingham. The company has also appointed Mr. F. S. Lill as its representative for Lincolnshire, and he will be based at the company's office, 57, Hounds Gate, Nottingham.

Changes of Name

Flather & Co., Ltd., have changed their name to Brush Bagnall Electric Traction, Ltd. At 26th December, 1949, the Brush Electrical Engineering Co., Ltd., held 999 £1 shares out of 1,000 issued.

Safflex, Ltd., has changed its name to Coupleflex, Ltd.

Aluminium Development Association

Two new publications have been issued by the Aluminium Development Association. The A.D.A. Directory of Members gives the names of the members of the Council, a brief statement of the constitution and objects of the Association and the names, addresses and other particulars of its member companies, including where applicable associate or subsidiary companies. In each case a brief description is given of the activities and products of the company. An index of products classified under aluminium and aluminium alloys is included.

The other brochure sets out in some detail the aims, activities and organization of the Association. The breadth of the Association's activities is indicated by an account of the more important work already accomplished and in progress, subdivided under the headings development, research, technical advisory service and technical education. Under the last subheading lists are given of the various information bulletins, brochures, research reports and films published or supplied on loan.

Report on Petroleum

The Association of Scientific Workers, 15, Half Moon Street, London, W.1, has published a report (price 6d) on petroleum. In this 23-page booklet a short survey of the history, sources and production of petroleum is made. There are some details of refinery operation and products of distillation. The electrical interest lies in brief references to transformer oils and electrical methods in exploration.

Educational

Full-time and part-time courses in engineering commence in September at the Kingston-upon-Thames Technical College.

The E.A.W. examination for demonstrators and saleswomen will be held on 14th December next, and the examination for electrical sales assistants on 30th November. (See advertisements in this issue.)

Catalogues and Lists

Glasgow Electrical Engineering Co., Ltd., 45-47, Pitt Street, Glasgow, C.2.—Two price lists of a.c. and d.c. electric motors and heavy duty V-belt drives.

Rapid Magnetic Machines, Ltd., Lombard Street, Birmingham, 12.—Catalogue of magnetic separating and lifting equipment.

Brush Electrical Engineering Co., Ltd., Loughborough.—Technical brochure (No. 11021) on flameproof induction motors type F.T. and F.B., 10 to 65 b.h.p.

Small Electric Motors, Ltd., Beckenham, Kent.—Two leaflets on 1 to 10 h.p. traction motors and transformers and chokes of up to 10 kVA and 10 kV.

Aquastat, Ltd., Romney House, Tufton Street, London, S.W.1.—Folder describing the "Aquastat" patented electrical process of water treatment.

Pilot Works, Ltd., Manchester Road, Bolton, Lancs.—Priced folder describing a hydraulic power cropper for cutting flat bar and sheets with up to 17 tons pressure on the shear blade.

Progress in Radiology

Impressions of the International Congress

By B. M. WHEATLEY, B.Sc., A.R.C.S., D.I.C.

THE recent International Congress of Radiology was the first to be held since the 1937 meeting in Chicago. The first Congress was held in London 25 years ago. Technical progress has been so rapid in the last thirteen years that much of the Congress was concerned with the use of apparatus and materials which had been invented or developed since the beginning of the war.

The subject of radiology is difficult to define since it overlaps physics, medicine, biology, and engineering. In general those whose work is in this subject tend to specialize in one particular branch, trying at the same time to understand the problems of their colleagues whose interest leads them to a different bias.

Before discussing some of the more important items likely to be of interest to non-medical readers, it may be useful to review the scope of the Congress. There were over 3,000 members from 35 different countries and during the week 108 reviews were presented in various symposia at Westminster, and over 300 papers were read in the sections of radiotherapy, radiodiagnosis, radiophysics, radiobiology and electrology. A large exhibition was held (described in the *Electrical Review* of 4th August). In addition there was a continuous showing of films of medical and technical interest. In the evenings there was a full social programme.

Diagnosis and Treatment

In describing some of the problems discussed at the Congress it is interesting to see how they arose. Not long after the discovery of X-rays they were used for diagnosis, primarily to see bone fractures. Then, as techniques were improved, they became capable of assisting the difficult diagnosis of internal diseases. The tremendous power of modern X-ray diagnosis is well known, and in developing this the doctor has been aided by manufacturers of electrical equipment and X-ray tubes as well as by the photographic experts. In diagnosis progress has been continuous and modern techniques differ from the old ones not in any fundamental way but by a host of important improvements.

However, in the use of X-rays for healing, as distinct from diagnosis, there is a radical change from previous practice. In any treatment of disease the central problem is that of dose determination. A chemist can weigh the drugs which a doctor prescribes, but how does one prescribe the dosage of X-rays? This problem was recognized soon after their therapeutic power was discovered and physicists took up the challenge to find a unit by which X-ray quantity could be measured, and to develop instruments to make the measurements.

Measurement of Radiation

International congresses offer the best means of discussing systems proposed by various workers, and some years ago, at such a congress, the unit of X-ray quantity was defined in terms of the ionization produced in a small volume of air. This unit was called the röntgen, after Professor Röntgen who discovered X-rays. It was also used as the unit of quantity of the gamma radiation emitted from radium which is used in the form of needles, capsules and plaques in the treatment of some forms of disease where it is easier to use than X-rays.

The röntgen as a measure of quantity of radiation was successful for all the forms of X-rays and gamma-rays in use until recently. The development of high-energy machines such as electrostatic and linear accelerators, betatrons and synchrotrons, and the wide availability of artificially produced radioactive sources has now presented the problem of measur-

ing amounts of radiation which by their nature are unsuited to measurement in röntgens. Many of the lectures described cautious clinical work with these radiations and several workers presented the results of their attempts at measuring the quantity of radiation produced from their apparatus under various conditions.

Betatrons and synchrotrons can produce rays corresponding in energy to many millions of volts and the ionization produced in air by them is very difficult to measure and is not a true guide to the energy absorbed from the beam by a patient. It was decided by the Congress that above three million volts the quantity of radiation should be measured in terms of ergs per gramme instead of röntgens.

Artificially produced isotopes present yet another problem, and it was decided that the strength of radioactive sources should be measured in terms of curies (after Mme. Curie, the discoverer of radium). The curie, which previously was defined in terms of the amount of gas in equilibrium with one gramme of radium, was freshly defined as a source in which 3.7×10^{10} atoms disintegrated every second.

Radioactive Isotopes

One of the obvious advantages over radium of radioactive isotopes prepared in a nuclear reactor, such as the Harwell atomic pile, is that they can be produced as liquids, wires or foils, or, indeed, in any form which is clinically useful. An even more important advantage is that isotopes introduced into the body behave as any other element. For example, radio-iodine is concentrated in the thyroid gland just as ordinary inactive iodine. In this way isotopes can be used in small quantities for "tracing" the way the body works and for diagnosing what is wrong when it is working inefficiently. Their presence in such minute quantities is detected with modern apparatus such as Geiger counters, or the even newer counter in which a photocell detects the scintillations which occur in a crystal when radiation falls on it. In larger quantities the isotopes can provide a localized source of radiation for therapy, and the use of phosphorus and iodine was described.

In therapy with X-rays or with radiations from radio-active materials, it is believed that the action is due to the fact that the radiations destroy living cells most readily at the instant when the cells are dividing. They therefore affect parts of tissue which are growing more rapidly than the rest, since rapid growth implies frequent cell division. A new branch of science, known as radiobiology, is concerned with the study of the effects of radiation on living cells, and over 30 papers were presented on recent research in this subject. The principal therapeutic use of radiation is in the treatment of cancer.

Range of Equipment

Transformer-operated equipment with sealed-off X-ray tubes is usually employed for conventional equipment ranging from 45 kV for sets used to treat skin diseases, to 200-400 kV deep therapy sets. Above this range the generators used are those more usually associated with nuclear physics laboratories. In addition to the problem of producing and measuring radiation there is the problem of directing it to the site of the disease, and a great amount of careful thought and engineering was described, which enables the best possible distribution of radiation to be located at a point which can be defined on the patient's skin.

Another problem of even more general interest is the fixing of an accepted tolerance level of radiation. This level is that which causes no harm to a person continually subject to general radiation. With many people using X-ray sets, or working in atomic research laboratories it is essential that they should not be affected by the stray radiation, and in well-organized establishments rooms are monitored with electronic instruments to determine the amount of radiation present and workers also carry instruments on their person to record the daily or weekly dose. The Congress fixed a new tolerance level, including a level for neutron exposure to which some research workers are subjected.

The general impression of the Congress was that of an international body of men and women, doctors, biologists, physicists and engineers who were trying to understand each other's problems in order that they could best make a contribution to the diagnosis and treatment of disease.

ELECTRICAL CONTRACTING:
Organization and Routine

By H. R. TAUNTON, A.M.I.E.E.

12—Orders in Hand

THE "day-sheet" may take various forms. It may be written in a printed duplicate book, similar to an order book; or on suitable loose sheets, numbered, with an abbreviated copy in a day-sheet book; or it may be typed on similar loose sheets with a carbon copy. This, on the whole, is, in practice, the best system. It is neater and more exact, labour saving and yet providing easily for possible extra copies. The office duplicates should be kept in some form of semi-permanent binding in numerical order, with an index to the contracts to which they relate.

Assuming the last to be the system adopted, a suitable form is quarto, printed both sides. The front will bear the firm's usual heading, and spaces for the serial number, date of issue, name and address of the customer, and the foreman's name. The rest is left blank for a description of the work covered. At the foot should be printed a reminder that any variation from the particulars given is to be notified before any time or material is booked to it and that the sheet is to be returned to the office as soon as the work it covers is completed.

Prompt Return of Day-sheets

Both rules are important. It is essential that the office should know of any variations at once, so that the customer can be notified and the day-sheet amended, or supplemented, if necessary. It is essential, too, that the day-sheet should be returned as soon as it is filled. It ensures that the sheets will not be left to be completed from notes, memory or guesswork, with consequent error. It assists the engineer to clear up any questions involved while the details are fresh in everybody's mind; and the accountant, who on a big contract, with many day-sheets, can be pricing up those completed, ready for the final account. This rule will need repeated emphasis. Foremen are strangely reluctant to observe it and, if they are allowed to, will hang on to their day-sheets to the very end of the contract, and after.

The back, feint-ruled for convenience, will repeat the serial number, and should be headed by the date of commencement of the work. Then, after some such wording as "Full details of time and material used to be noted below," the rest of the space will be ruled with columns for date, workman's name, hours booked, and material; and cash columns for cost. The cash columns are for office use only, and must not be filled in by the workman. Finally, a space should be provided for the date of completion and for the foreman's signature.

Accounting for Extras

It is obvious that the details of time and material are not to be filled in on all day-sheets. It would be superfluous and time-wasting for the foreman to keep a record of all the material used on a contract or job of more than a certain small value. But it is essential that he should do it in the case of all extras, however large, for which no separate costs account exists, and whether the job is priced or is day work: in the one case as a check on the estimate, and in the other as the basis of the charge for it.

When a day-sheet is issued for an original job for which details are not required, the wording on the sheet calling for them should be cancelled. In all other cases, the workman is to understand that he must fill them in fully.

In the date column he must fill in not that of the working week but that of the actual day the work is done, unless it is continuous for a week. In the name column he must fill in the actual name of the man employed on it, not merely "electrician" or "mate." The time re-

corded should be the gross time: i.e., including overtime allowances when overtime is worked. Occasional random checks should be made of day-sheet records against time-sheet records, and an explanation sought if they do not tally —as often they do not.

In the material column, all material must be entered as soon as it is used, in full detail. No generalities, such as "sundries," should be permitted. This will entail a certain amount of repetition, but it is the only way to ensure accuracy. A day-sheet in which everything is neatly summarized is suspicious evidence that it has not been entered up until the whole job was completed.

If there is a representative of the customer on the job, or of the architect—clerk of works or general foreman—his signature should be obtained to all day-sheets, especially those for day work. It makes later argument about the amount of time or material booked to an extra, if not impossible at least difficult.

Starting a Contract

The day-sheet and its duplicate having been typed, the one should be filed and the other laid before the manager or responsible engineer. The first concern is the choice of a foreman. On this point it is usually advisable to consult the supervisor, who will know the personal characteristics of the men available for the post. If trade has been slack, a good man, normally a charge-hand, may be at the time working under another and his claims will be first considered. It is discouraging to him to be relegated for any length of time to the lower grading.

If trade is brisk, however, the usual foremen may already be employed on other contracts. Should the new contract be an important one, it may pay to take one of them off a smaller job or even a large one nearly completed, if a suitable substitute can be found for him. This course is usually to be avoided. "Swapping horses while crossing a stream" always means some loss of time and money, and often difficulty and confusion arising from divided responsibility. Should the contract be a smallish one, straightforward and easily supervised, the opportunity may be taken of trying out some one of the electricians whose character and work have been favourably noticed. There may be some little risk in the experiment, but it is better than the last resource, the engaging of a strange charge-hand specially for the job. However good his references they cannot be as reliable as one's own knowledge of one's own men.

The foreman chosen, the easier selection of his men can be left for the moment. For the first few days, probably, he will want no more than a mate or boy, if he wants as much. He will be fully occupied in familiarizing himself with the building in which he is to work, studying his specification, arranging a lock-up for his stuff, getting out his main runs, and so on, and in arranging for the dispatch of sufficient tools and tackle and material to enable him to make a start.

Foreman's Instructions

The documents which will accompany the contract day-sheet or sheets are primarily a full copy of the specification and schedules and a set of marked plans and drawings, of which the office should have duplicates. The day-sheet should have attached to it a sheet of instructions, amplifying the general terms. This may be little more than an emphasis on certain points to which it is wished to call attention, or a note of the order in which various sections are to be carried out. In other cases it may be a lengthy document, a supplementary specification.

If the specification called for alternatives, those finally accepted must, of course, be noted, with all agreed modifications or corrections. Lengthy instructions of the same kind will usually be needed if the original specification is the contractor's. Probably he will have made it no more definite on many points than was necessary to secure the order, and will now have to make clear to the foreman what was in his mind when he estimated.

With the instructions, or as soon after as possible, the foreman should be given blue-prints of the diagrams of connections, with details of the main switchgear and cables, together with schedules of the balancing scheme and the arrangement of circuits proposed. All these important details should be worked out on the drawing-board as a whole, not left to the foreman's judgment and piecemeal rule of thumb. They may have to be

modified later in the light of the actual conditions on the site, but they serve at least as a definite working basis.

The foreman will naturally also be given the advice notes of the tools and tackle and material dispatched to the site. He should also be given a note of any special material, such as switchgear, that has been requisitioned for later delivery, to avoid the possibility of his duplicating it in his own requisitions. A batch of time-sheets, a few blank day-sheets for an emergency, a quarto correspondence book, a requisition book, and some foolscap and commercial envelopes will complete the paper equipment he will need at starting.

Plant and Material

The tools and tackle required on a contract will naturally vary with its type; and in any case much will depend on the character of the building. A preliminary visit by the supervisor will determine the first needs in the way of tackle—scaffolding, ladders, trestles, etc., to enable the foreman to carry on until he can decide for himself what more, if any, is needed. Similarly with tools. For a screwed conduit job a few benches, vices and various stocks and dies, will serve for a beginning, together with the usual assortment of jumpers, hacksaw blades and other consumable items.

The first consignment of material will naturally depend on the wiring system specified. The engineer will requisition this on the basis of his estimated figures. He will, as a rule, content himself with sending a proportion large enough (if the size of the job permits) to secure any possible special terms for delivery. Suitable round quantities of accessories for the amount in question he can generally leave to the discretion of the storekeeper, with the guidance of the specification as to make and type.

One of the first things to be done on receipt of an order for a contract, is to prepare an itemized list of all the material that will be required for it, compiled from the estimate. Unless that is a short and simple one similar material will be repeated in different parts of it, and will have to be collected in one item; or it may have been priced together as a schedule rate for a run and will have to be dissected. The list should give makers' catalogue numbers where available. Its purpose is twofold. It is, first, a guide to the office in ordering special material, which may need time for delivery, and for which it is neither advisable nor necessary to wait the foreman's requisitions; and secondly, it is a valuable and simple check upon the requisitioning.

If the list is made out on one vertical half of a sheet of foolscap, the other half can be ruled in a series of narrow columns. In these can be entered the quantities of each multiple item as they are requisitioned and delivered. For instance, if the total quantity of $\frac{5}{8}$ in conduit required is listed as 8,000 ft, the first consignment ordered by the office, of, say, 5,000 ft, will be at once entered against it. If, then, the foreman requisitions further batches of 2,000 and 1,000 ft, each duly entered against it, and follows up with a further requisition for 500 ft, it is obviously time to ask questions. Somebody is at fault, unless there have been variations to account for the excess.

The procedure in starting a smaller job is in all essentials the same. It is only a question of degree, and the same general principles remain. Anyone can replace a fuse, but it is no use wasting money by giving even a little £5 job to a man unused to the particular kind of work it calls for. Instructions should be as complete for a small repair as for a large contract, though they may only occupy a couple of lines of typing on the day-sheet. And material should be as carefully checked. Jobbing work can generally be made to show a larger percentage of profit than a large but competitive contract. It is foolish to fritter it away by careless handling.

Orders for Supplies

In putting in hand orders for supplies, there is no question of "starting": when the article is delivered the operation is started and completed simultaneously. The order has been recorded in the form of an uncompleted advice note. The next step is to order the article required to "fill" it: say an electric iron. It may have to be obtained from a supplier, in which case the obvious thing is to write out an order. The counterfoil is then available for booking to a cost ledger account. When the supplier's advice

note is received, the firm's own advice note in its special book can be completed and dispatched. If the iron is in stock, it can either be requisitioned from the stores, or they can be considered as a supplier and an order written out in the usual way in a separate book kept for the purpose. The advantage of the second method is that the costing clerk has only to deal with the counterfoils in order books instead of also having to refer to those in a requisition book. Whichever is adopted, the storekeeper supplies the iron and completes the advice note to be dispatched with it.

A minor difficulty arises when the customer's one order comprises several articles, some of which may be in stock and others not. If none is in stock, they may have to be obtained from different sources, or some may need longer for delivery than others. In such cases, usually the simplest thing to do is to use ordinary advices from the general advice book, to be sent with each consignment, and when the order is filled, the order advice note can be completed, for the sake of its counterfoil, and simply suppressed.

Piecemeal Orders

On a largish contract orders for fittings may be given piecemeal, and may be extensively altered, repeated or cancelled, and it may become difficult to obtain a clear idea of what fittings are in hand and what are still needed to complete the installation. It is well, therefore, to make out a separate list of all fittings required, with reference numbers to correspond with those of the schedule of points, easily checked or amended as necessary.

Something more than a precise system of advice notes is needed for good service. On a job the foreman can be left to deal adequately with the supply when it is delivered to him. Not so the customer. If it is an appliance, such as an iron or a fire, pains must be taken to ensure that he is not put to trouble or exasperating delay before he can use it. It should not only be wired, but fitted with a plug to suit his sockets. If the article is something more complicated, such as a vacuum cleaner or a refrigerator, the maker's full instructions should be sent with it; or, better, a man may be sent with the article to connect it up and give a preliminary demonstration — without charge whenever possible. It is an elementary form of service, always appreciated.

Delivery by hand, when distance permits, is always to be preferred. It may not be cheaper but it is quicker and, for fragile goods, safer; and it is valuable in its suggestion of efficient service. Almost the customer is persuaded that his order is receiving individual attention when he sees it delivered by a "special messenger," though it may be only the stores boy. A smartly painted light van is useful in this connection, and an excellent advertisement; nor need the whole cost of its upkeep be written off as a standing charge for it can, of course, be used for the delivery of material to jobs.

If supplies are to be sent direct to customers from the makers or wholesalers, one of your own labels should accompany the order for them, to be used when the goods are dispatched. It is yourself you want to advertise, not the manufacturer. He will keep his end up very well without your gratuitous help.

The custom of some firms, of following up an order for supplies by an inquiry whether it is giving satisfaction is rarely appreciated. A compliment solicited has no value of sincerity. If the customer has anything other than a pretty phrase to hand to you, it will be sincere enough, but there will be no need to ask for it.

Gas Turbine School

BRITAIN'S school of gas turbine technology, the only one of its kind in the world, is re-opening at Farnborough Place, Farnborough, Hants, during October. This school, which is maintained by Power Jets (Research & Development), Ltd., has been moved because of expansion from its old premises at Lutterworth, where Air Commodore Sir Frank Whittle's team designed and tested some of the earliest jet engines.

Founded in 1944 to instruct Dominion Air Force personnel in aircraft jet engines, the school now gives instruction in the technicalities of the use of gas turbines in high-speed aircraft, locomotives, road vehicles, ships, power stations, process power and other industrial applications. It has in its possession a comprehensive collection of gas turbine equipment and engines, including test houses and jet aircraft, on which installation and practical ground instruction is given. Actual test-bed runs are undertaken by the students themselves.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

REPORTS AND DIVIDENDS

Venner Time Switches, Ltd., reports a trading profit for the year ended 31st December last of £54,878, as compared with £1,606 for 1948, and after deducting depreciation, directors' emoluments, etc., a net profit of £14,828 (against a loss of £28,729). Taxation absorbs £3,518, and it is proposed to pay an ordinary dividend for the year of 5 per cent, less tax (against nil), leaving £15,529 to be carried forward (against £11,479 brought in).

In his statement issued with the report and accounts, Mr. A. A. Rowse (chairman) says that with regard to time switches the removal of restrictions was a primary factor in the improved results now submitted. The position as regards electricity meters is not so satisfactory. The policy of the nationalized industry has so far been to restrict purchases and to confine such purchases as have been made to a small group of manufacturers selected by the Authority without any consultation with the industry as a whole. This policy has had the effect of confining the company's meter sales to the export market. Development work on the electric storage battery has continued throughout the year. Since the end of the period under review the directors felt sufficiently sure of the battery as a commercial proposition to make it available generally. It has been standardized in a range from ½ to 48 Ah. Applications to deaf-aid sets, to aircraft, to miners' lamps, and to the photographic industry have already been made. The current trading position is in the main satisfactory. Output is at a high level and there is a good order book.

The Dubilier Condenser Co., Ltd., held its annual meeting on 15th August, Mr. W. H. Goodman (chairman) presiding. In his statement circulated with the report and accounts the chairman says that the production from the factories during the year under review increased in quantity and value, but competition in home and export markets necessitated the reduction of selling prices to levels which in some cases are less than those received for similar products before the war. So far they have been able to offset the rising trend of basic costs by improved designs and manufacturing methods. During the early part of the year the demand for their products for the radio industry was below expectations. The scope of their activities in the industrial field has been expanded and they have developed new types of capacitors for this purpose which have made a valuable contribution to their export business. The value of outstanding orders is larger than at this time last year. Export sales have been developed and the value of these sales for the past year was almost equal to the total sales of the company in a pre-war year. A number of interesting designs of capacitors are approaching final stages of development. Further progress has been made with the design and manufacture of capacitors for the elimination of electrical interference in which connection the company is co-operating with the leading manufacturers of electrical devices to determine the most suitable type of units for their use.

Telephone Rentals, Ltd.—The annual meeting was held on 21st August, Mr. F. T. Jackson (chairman and joint managing director) presiding. In his statement circulated with the report and accounts the chairman says that it is proposed to increase the authorized capital by the creation of 2,000,000 shares of 5s each. There is no intention of issuing these immediately, but as the business grows it is essential that they should have them available as and when required. Their reserves now reach a substantial figure and subject to the consent of the Capital Issues Committee they propose in due course to make a free bonus issue to shareholders of 400,000 ordinary shares of 5s each, paid up by utilizing £100,000 of such reserves. The company is decentralizing its organization in the London and Home Counties area and setting up four areas.

Oldham & Son, Ltd.—Presiding at the annual meeting held on 18th August, Mr. J. Oldham (chairman) said that the total of Oldham miners' lamps in use had reached a figure amounting to many hundreds of thousands, while the continued growth of road transport requirements for public, commercial and private purposes had raised to high levels the demand for electric storage batteries of every description. In the domestic market, sales and service were effected through the Oldham battery service station organization, comprising several hundred automobile and electrical specialists throughout the country. Developments concerned with their associated company, Oldham & Son (Africa), Ltd., were pro-

ceeding satisfactorily, and since the last report the French subsidiary, Société Française des Procédés Oldham, had been established in full manufacturing operation. In India negotiations had been completed with the Indian Government for the establishment of a company there with the title Oldham & Son, India, Ltd. Land had been acquired in Madras, and manufacturing was expected to commence early in the new year.

The North of Scotland Hydro-Electric Board.—Approval has been given for a further issue of £15 million of 3½ per cent guaranteed stock, 1977-80 to the National Debt Commissioners at par. Proceeds will be applied in repaying temporary advances from banks, in defraying further expenditure on constructional schemes and for authorized purposes. Previous issues of the Board have been as follows: July, 1947, £5 million 2½ per cent, 1967-72 at par; July, 1948, £6 million 3 per cent, 1968-70 at par; October, 1948, £6 million 3 per cent at 101; May, 1949, £10 million 3 per cent, 1989-92 at par. The first issue was publicly offered and the remainder have been issued direct to the National Debt Commissioners. The maximum borrowing powers of the Board are £100 million.

Christy Bros. (Chelmsford), Ltd., report a group profit for the year to 31st March last, after deducting all charges, including taxation, of £30,472, as compared with £17,758 for the preceding year. The ordinary dividend for the year is 6 per cent (against 5 per cent), £8,801 has been transferred in the accounts of one subsidiary to general reserve and the amount carried forward for the group is £18,446 (against £3,100 brought in).

The English Electric Co., Ltd., has declared an interim ordinary dividend of 4 per cent, less tax. This is at the same rate as the previous year but is payable on capital increased last February by an issue of 589,789 £1 shares to holders at 35s each.

Thorn Electrical Industries, Ltd., reports a consolidated trading profit for the year ended 31st March last of £231,738, as compared with £187,184 for the preceding year, and after deducting depreciation and amortization £77,175, taxation £78,527, and other charges, there is a net profit of £58,816 (against £51,959). General reserve receives £15,000, and provision for future tax in respect of relief on initial allowances £10,000. The ordinary dividend for the year is unchanged at 20 per cent, and £37,300 is carried forward (against £35,521 brought in).

The Palestine Electric Corporation, Ltd., reports a surplus on operation and sundry receipts for 1949, after charging expenses, of I£1,047,285, as compared with I£420,303 for 1948, and after deducting depreciation I£334,270, profits tax I£380,000, etc., and placing I£125,000 to general reserve, there is a net balance of I£170,689 (against I£97,511), to which is added I£240,810 brought in, making I£411,499. The ordinary and "A" ordinary dividends are maintained at 5 per cent, tax free.

Ultra Electric (Holdings), Ltd., reports a group trading profit for the year to 31st March last of £60,642, as compared with a group trading loss of £89,689 for the previous year. Net special provisions absorbed £42,498, leaving a group net credit of £18,144 (against a net debit of £236,530). The Holding Company shows a loss for the year of £140 (against a net profit of £241).

The Reason Manufacturing Co., Ltd., reports a revenue for the year ended 31st January last of £5,145 (same), and after deducting debenture interest, £1,000, there is a balance of £4,145 (against £4,137), to which is added £12,784 brought in, making £16,929. Taxation requires £375, and the ordinary dividend for the year is maintained at 20 per cent.

The Chloride Electrical Storage Co., Ltd., has declared an interim dividend on the "A" and "B" ordinary stock of 5 per cent actual, less tax (same).

The Automatic Telephone & Electric Co., Ltd., is paying an interim dividend of 3 per cent (unchanged).

LIQUIDATIONS

L. Bunce (Electrical), Ltd.—Winding up voluntarily. Liquidator, Mr. D. Tanfield, of Wall & Tanfield, 196, Wolverhampton Street, Dudley. Particulars of claims to the liquidator by 19th September.

Riley Clock & Instrument Co., Ltd.—Winding up voluntarily. Liquidator, Mr. D. Q. Holland, Crown House, Aldwych, London, W.C.2.

Marconi-E.M.I. Television Co., Ltd.—Meeting of members on 25th September, at 3, Frederick's Place, Old Jewry, London, E.C.2, to receive an account of the winding-up by the liquidator, Mr. T. Howorth.

BANKRUPTCIES

J. Bannister, carrying on business as an electrical contractor at 2, The Wiend, Wigan.—Receiving order made 15th August on debtor's own petition.

R. Davidson, 199, High Street, Lewes, Sussex, electrical illuminating engineer.—Trustee, Mr. J. S. Bradley-Hole, 6 & 7, Old Steine, Brighton, 1, appointed 10th August in place of Mr. A. E. Orbell (deceased).

FINANCIAL SECTION

STOCKS and SHARES

THE gilt-edged markets of the Stock Exchange suffered a very temporary set-back from the Government's announcement that £15 million of North of Scotland Hydro-Electric Board 3½ per cent stock, 1977-1980, had been issued to the National Debt Commissioners, under Treasury guarantee, at 100. Three years ago, the Board offered for public subscription £5 million 2½ per cent guaranteed stock, 1967-72, at 100. (The present price is about 90.) The National Debt Commissioners at that time had to take 29 per cent as they had underwritten the issue. It did not take the Consol market long to recover and prices of gilt-edged stocks continue to be amongst the firmest in the House. British Electricity 3½ per cent 1976-1979 has risen to 2⅜ premium.

South African Orders

Three of the companies which are expected in the Stock Exchange to benefit from orders to be placed for power plant by the Electricity Supply Commission of South Africa, are Associated Electrical Industries, English Electric and General Electric. The prices hardened on the announcement being published last week. It was known, of course, that these companies, and others working in the same field of industry, have enough business on hand, and in sight, to keep them occupied for several years to come, but the South African orders should strengthen their position.

Investment Inquiry

Inquiry came into the Stock Exchange market for the shares of undertakings likely to benefit more or less directly from the considerable developments contemplated in South Africa. The Home industry is up against competition from American and European manufacturers, but in the Stock Exchange the view is expressed that the British companies are well able to hold their own. Lancashire Dynamo, C. A. Parsons and Reyrolle are amongst the other companies which, according to Stock Exchange reasoning, will derive material advantage from the orders likely to be placed by the South African Supply Commission. Lancashire Dynamo at 95s are 2s 6d up. English Electrics rose 1s to 46s 6d.

Last Year's Results

With the main season of company dividends and reports nearing its end, the following table is given to summarize some of the company results which have been published over the past two or three months. Earnings are shown as the percentage on ordinary capital represented by profits available, after all charges, for distribution and reserves. Comparison with the rate per cent paid indicates, of course, the extent to which the latter is conservative or otherwise. Although a little irregularity appears, comparisons provide in the majority of cases a satisfactory impression about the course of profits last year and the restraint with which they were distributed.

Company	Earned %		Paid %
	1948	1949	
G.E.C.	57.4	66.3	17½
Electric Constr.	44.1	61.8	15
Revo	68.8	55.6	27½
E. K. Cole	39.6	77.2	20
Walsall Cond.	209.1	172.2	70
Aron Meter	16.7	29.3	15
B.I.C.	37.7	47.5	6⅝
Auto. Tel.	57.5	72.4	12½
Tel. Mfg. Co.	36.1	31.7	10
Enfield Cables	29.8	37.5	7½
London Elec. Wire	88.1	94.2	10
Siemens	18.8	18.9	7½
Henley's Tel.	54.8	66.6	20
Newman Ind.	25.2	4.1	10
Lancs. Dynamo	51.6	54.5	22½
A. West	—	51.9	10
A.E.I.	70.6	92.8	15
Laurence, Scott	32.7	46.1	12½
Tel. Condenser	91.1	69.5	15

Price Changes

Oldham & Son ordinary improved to 5s 6d after the meeting at which the chairman said that the board did not want shareholders to feel that dividend limitation was a long-term policy of the directors. This is held to hint at a possible increase later on, in the distribution. Brush ordinary are harder at 6s. The company has acquired a controlling interest in Vivian Diesel Engine Works in Vancouver, B.C. Other improvements since a week ago include Thorn Electrical 18s 9d, Pye 32s 6d, Burco 20s 9d, Lucas 31s 6d, International Combustion 17s, Cromptons 12s and De La Rue 25s 9d.

Gauge and Tool Makers' Meeting

The annual general meeting of the Gauge and Tool Makers' Association will be held at the Waldorf Hotel, London, on 6th September, at 2.30 p.m. It will be preceded by an informal luncheon for members of the Association only.

ELECTRICITY SUPPLY

Power Plant Extensions
July Output 14 per cent Higher

THE British Electricity Authority has received the consent of the Ministry of Fuel and Power to the construction of the second half of the new power station at Bold, near St. Helens, Lancs. The authorization covers two turbo-alternator sets each 30,000 kW, two boilers each of an evaporative capacity of 300,000 lb/hour, and one cooling tower. Official consent to the establishment of the station and the installation of the first section was given last May. The station, when completed, will have a total installed capacity of 120,000 kW.

Two 60,000 kW turbo-alternators were put into service in July, an English Electric set at Stourport and one of British Thomson-Houston Co. manufacture at Staythorpe. In addition a 180,000 lb/hr Mitchell boiler was commissioned at Ferrybridge and a 365,000 lb/hr Babcock & Wilcox boiler at Cliff Quay. The net increase in installed capacity compared with June was 108,000 kW, making a total of 14,413,000 kW.

Generation in July

The month's generation figures issued by the Ministry of Fuel and Power show an increase of 14.2 per cent compared with a year ago. This was well above the average for the first half of the year (10.2 per cent) and probably reflects the less settled weather than in 1949. Another pointer to this is the rise in hydroelectric output.

St. Helens Reinforcement

The initial stage in the reinforcement of supply to St. Helens (Merseyside and North Wales Division) was completed recently when the first 60 MVA transformer, new 33 kV switchgear and two interbus 33/6.6 kV transformers were energized and put on load.

Quick Construction

Reference is made in the annual report of the Toronto Hydro-Electric System to the steam and diesel generating units erected by the Hydro-Electric Commission of Ontario to meet the shortage of power. The four 5,000 kW units allocated to Toronto were installed in a plant erected near Ashbridge's Bay, the time between breaking ground and the actual delivery of energy to the system being little more than six months. The report shows a gross operating income of $16 million and a net balance of $615,483, of which $600,000 has been allocated to frequency standardization charges. Sales during 1949 totalled 1,698.5 million kWh, an increase of 58.3 million.

Large American Sets

The first of two 150,000 kW cross-compound turbo-generators to be installed in the new Tanners Creek power station of the Indiana and Michigan Electric Co. is scheduled for operation next February.

Fuel Consumption and Energy Generated in July

	Fuel consumed Thousand tons		kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Oil	Steam	Water Power	Total*		
British Electricity Authority ...	2,116	3.0	3,605	25	3,640	3,421	14,033
North of Scotland	12	1.0	15	66	85	84	380
Total for July, 1950	2,128	4.0	3,620	91	3,725	3,505	14,413
Total for July, 1949	1,925	2.5	3,192	56	3,262	3,062	13,441
Increase per cent	+10.5	+60.0	+13.4	+62.5	+14.2	+14.5	+7.2
Total for year to date (7 months) ...	17,875	38.0	30,057	736	30,919	29,176	—
Total for corresponding 7 months of 1949	16,491	28.0	27,121	705	27,939	26,348	—
Increase, per cent	+8.4	+35.7	+10.8	+4.4	+10.7	+10.7	—

* The total figure includes generation by oil engines, refuse destructors and waste heat plants amounting to 5.9 million, 0.1 million and 7.7 million kWh respectively in July, 1950.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1945

6605. Marconi's Wireless Telegraph Co., Ltd.—Electron-discharge device. 15th March, 1945. (643843.)

12573. British Thomson-Houston Co., Ltd., and Ruff, H. R.—Electric-discharge lamps. 24th December, 1946. (643642.)

17542. British Thomson-Houston Co., Ltd.—Voltage stabilizers. 10th July, 1945. (643643.)

23566. Newton, E. P. (Telefonaktiebolaget L. M. Ericsson).—Excess voltage protective arrangements for telephone apparatus. 12th September, 1945. (643646.)

1946

20020. Philips Lamps, Ltd.—Circuits for phase-modulation or frequency-modulation of an electrical oscillation. 4th July, 1946. (643712.)

20737. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. — Variable condensers. 11th July, 1946. (643650.)

23162. Martin, M. T.—Electrical musical instruments. 2nd August, 1946. (643846.)

26425. Rangabe, A. R., Wickham, R., and Buckingham, J.—Electron-discharge devices. 4th June, 1948. (643654.)

26426. Thomson, A. F. H., Wright, G. P., Rangabe, A. R., and Buckingham, J.—Magnetron electron-discharge devices. 19th June, 1948. (643655.)

27642. Gittins, J. F., Lea-Wilson, C. P., and Buckingham, J.—Cathodes for electron-discharge devices. 14th October, 1948. (Cognate application 5524, 26th February, 1947.) (643656.)

31628. British Thomson-Houston Co., Ltd. (General Electric Co.).—Machine sets such as turbine-driven generating plants. 24th October, 1946. (643848.)

33250/1. Philco Corporation. Optical system. 8th November, 1946. (643658/9.)

33310. Électricité de France.—Apparatus for transmitting terms to a distance. 8th November, 1946. (643850.)

36900. Centre National de la Recherche Scientifique. —Electrostatic machines. 13th December, 1946. (643660.)

37838. Kablo, Akciova Tovarna Na Kable a Dratena Lana, and Havlicek, J.—Electric couplings of the plug-and-socket type. 24th December, 1946. (643661.)

1947

545. Scott. H. H.—Electric filter. 7th January. 1947. (643662.)

546. Scott, H. H.—Transmission of electric signals. 7th January, 1947. (643854.)

717. Hart, G. W.—Radio range-finding apparatus. 18th December, 1947. (643663.)

2519. Nathanson, M. — Fluorescent tube lighting systems. 27th January, 1947. (643781.)

2958. Centre National de la Recherche Scientifique. —Electrostatic machines. 30th January, 1947. (Cognate application 2959, 21st September, 1945.) (643664.)

7300. Standard Telephones & Cables, Ltd.—Superheterodyne radio receiving sets. 17th March, 1947. (643669.)

7699. British Thomson-Houston Co., Ltd., and Wilcox, T. W.—Control of high-voltage electrical power systems. 7th September, 1948. (643670.)

8443. Philips Lamps, Ltd.—Circuits for the transmission of ultra-high-frequency oscillations. 28th March, 1947. (643671.)

12170. Freins Jourdain, Monneret.—Electromagnetic track brakes for rail vehicles. 6th May, 1947. (643673.)

13558. British Thomson-Houston Co., Ltd.—Projection lamps and mountings therefor. 20th May, 1947. (643861.)

13876. British Thomson-Houston Co., Ltd.—Frequency sensitive circuits. 23rd May, 1947. (643677.)

15817. Nathanson, M.—Fluorescent tube lighting systems. 16th June, 1947. (643784.)

16644. Wallace & Tiernan Products, Inc.—Electrical chlorine concentration limit indicator. 24th June, 1947. (643865.)

16780. Standard Telephones & Cables, Ltd.—Driving device for power-driven telephone switches and similar switching members. 25th June, 1947. (643718.)

17773. Marconi's Wireless Telegraph Co., Ltd., and Ramsay, J. F.—Radio mirrors and wave-guide duct systems. 2nd July, 1948. (643679.)

21706. Better Packages, Inc.—Electrically controlled tape strip serving machine. 7th August, 1947. (643731.)

22667. Centre National de la Recherche Scientifique. —Directional aerials. 14th August, 1947. (643738.)

22882. Standard Telephones & Cables, Ltd., and Gillett, W. F. H.—Means for eliminating leakage across the contacts of electrical switching devices. 13th August, 1948. (643785.)

22883. Standard Telephones & Cables, Ltd., and Roberton, J. S. P.—Electro-acoustic transducers. 13th August, 1948. (643786.)

30867. Perivale Clock Manufacturing Co., Ltd., and Brown, T. A. — Synchronous electric striking and chiming clocks. 22nd November, 1948. (643751.)

30929. Siemens Bros. & Co., Ltd., Gachet, E. J., Hards, E. J., and Christian, D. A.—Electromagnetically operated step-by-step mechanisms. 19th November, 1948. (643894.)

32155. Moravian Electrical Engineering Works, National Corporation, and Klima, V.—Commutator windings for multi-phase commutator machines. 5th December, 1947. (643753.)

33628. Collins Radio Co.—Radio receiving and frequency conversion systems. 19th December, 1947. (643902.)

35061. Moravian Electrical Engineering Works, National Corporation, and Klima, V.—Winding for commutating machines with large output per pole. 31st December, 1947. (643758.)

1948

1179. General Electric Co., Ltd., and Harrold, A. E.—Coil winding machines. 4th January, 1949. (643686.)

1282. Westinghouse Electric International Co.—Elevator systems. 15th January, 1948. (643908.)

2460. Philips Electrical, Ltd.—Devices for generating high-frequency electrical oscillations. 27th January, 1948. (643909.)

2538. Carter Carburettor Corporation. — Dynamo-electric machine commutation. 28th January, 1948. (643767.)

4044. General Electric Co., Ltd., and Dale, S. H.—Control systems for direct-current electric motors. 10th February, 1949. (643771.)

4045. General Electric Co., Ltd., and Dale, S.H.—Electric motor control systems. 10th February, 1949. (643772.)

4422. Hogben, R. S., and Cook, W. R. J.—Electro-mechanical resonator. 16th February, 1948. (643689.)

4769. Metropolitan-Vickers Electrical Co., Ltd.—Synchronization of saw-tooth wave generators. 18th February, 1948. (643911.)

5989. Department of Commerce, Director of the Office of Technical Services of.—Cathode-ray oscilloscopes. 27th February, 1948. (643912.)

6250. Birlec, Ltd.—Metallurgical apparatus. 28th February, 1948. (643800.)

6357. Stoddard, G. C.—Dynamo-electric machine. 29th February, 1948. (643801.)

6863. English Electric Co., Ltd., Asbury, A., and Wilson, G. R.—Apparatus for providing a continuous indication dependent on the tension in material passing through a treating machine. 7th March, 1949. (643775.)

7133. Metropolitan-Vickers Electrical Co., Ltd., Hall, J. S., and Garland, J.—Turbine or like blade securing means. 9th February, 1949. (643914.)

7462. Westinghouse Electric International Co.—Fluid-blast electric circuit interrupters. 11th March, 1948. (Addition to 600,733.) (643808.)

8398. Philips Electrical, Ltd.—Electronic amplifiers having a constant or substantially constant gain. 22nd March, 1948. (Addition to 625915.) (643915.)

8448. General Electric Co., Ltd.—Electrical on-load switching apparatus. 22nd March, 1948. (643810.)

9074. La Mont International Association, Ltd., and Bower, F. W.—Feed heating and feed distribution in water tube boilers. 31st March, 1948. (643813.)

9510. Bullers, Ltd., and Perrins, G.—Electric insulators having semi-conducting glazes. 5th May, 1949. (643814.)

10517. General Electric Co., Ltd., Baker, W. F., and Spencer, J. R.—Welding of seams in metallic tubing and between metallic parts. 1st April, 1949. (643816.)

10599. Morphy-Richards, Ltd., Simon, L. J., and Simon, R. W.—Means for controlling brush pressure in floor scrubbing machines. 16th March, 1949. (643817.)

,1010. British Thomson-Houston Co., Ltd.—Apparatus for gauging and sorting lengths of tubing or rod. 21st April, 1948. (643818.)

12994. Triggs, W. W. (Carnegie-Illinois Steel Corporation).—Electrodeposition of tin. 12th May, 1948. (643928.)

14224. Standard Telephones & Cables, Ltd., and Grayson, H.—Television receivers. 26th May, 1948. (643694.)

14343. Philips Electrical, Ltd.—High-frequency coils. 27th May, 1948. (643935.)

15570. British Thomson-Houston Co., Ltd.—Organo-silicon compounds. 9th June, 1948. (643941.)

16082. Philips Electrical, Ltd.—Circuit arrangements for amplifying ultra-high-frequency oscillations. 15th June, 1948. (643946.)

18876. Fry, A., and Fry, F. A.—Power transmission means comprising electric motors. 2nd July, 1949. (643952.)

18918. Westinghouse Electric International Co.—High voltage disconnecting switches. 14th July, 1948. (643953.)

19482. O'Shei, W. E.—Electric heaters for vehicle and other windscreens or windows. 26th July, 1949. (643954.)

19848. Simplex Electric Co., Ltd., and Panisset, D. S.—Automatic safety device for use in connection with electric air-heaters. 25th July, 1949. (643695.)

20342. Standard Telephones & Cables, Ltd.—Regulated r.f. power supply. 30th July, 1948. (643699.)

21211. British Thomson-Houston Co., Ltd., and Scratchley, A. V.—Dynamo-electric machines. 18th July, 1949. (643702.)

23539. Parsons & Co., Ltd., C. A., Parker, A. C., and Rochester, J. C. O.—Electronic current stabilizing devices. 7th September, 1949. (643831.)

24799. British Thomson-Houston Co., Ltd.—Turbine-generator load control system. 22nd September, 1948. (643834.)

33165. Metropolitan-Vickers Electrical Co., Ltd., Ashe, T. S., and Pedley, D.—Resistance thermometers. 20th December, 1949. (643837.)

33224. Standard Telephones & Cables, Ltd., Burr, H., Hall, G. T. W., and Harris, L. W. J.—Measuring devices. 24th December, 1948. (643838.)

1949

6486. Marconi's Wireless Telegraph Co., Ltd., and Cooper, V. J.—Apparatus for testing amplifiers. 2nd December, 1949. (643839.)

1950

4647. La Mont International Association, Ltd., and Bower, F. W.—Feed heating and feed distribution in forced circulation water tube steam boilers. 31st March, 1948. (Divided out of 643813.) (643840.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month of the dates shown:—

9th August.

CONTOPHASE. No. 675,379. Class 9. Electrical apparatus and instruments and parts thereof, all included in Class 9.—Metropolitan-Vickers Electrical Co., Ltd., St. Paul's Corner, 1-3, St. Paul's Churchyard, London, E.C.4.

SIMPLOPHONE (design). No. B675,741. Class 9. Sound amplifiers for telephones, and intercommunication telephonic apparatus.—British Surgical Industries, Ltd., New Era Works, Purley Way, Croydon, Surrey.

GIBELEC. No. 684,671. Class 9. Electrical apparatus included in Class 9.—J. W. Gibson, Old George Yard, Cloth Market, Newcastle-on-Tyne.

AVOCET. No. 686,037. Class 9. Electrical instruments and apparatus not included in other classes; apparatus, instruments and devices for use in radio reception and transmission, television, sound producing, reproducing, recording, receiving, transmitting and amplifying; scientific, photographic, cinematographic and optical apparatus and instruments; and parts (not included in other classes) of all such goods.—The Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, 21, Douglas Street, London, S.W.1.

RUSHLITE DRY BATTERY (design). No. 688,852. Class 9. Dry batteries.—Burgess Products Co., Ltd., Brookfield Road, Hinckley, Leics.

16th August.

ESCALIFT. No. 689,160. Class 7. Electrically operated elevating chairs for use in moving invalids or the like from one storey of a house to another.—Shepard Elevator Co., Cincinnati, U.S.A. Address for service c/o Stevens, Langner, Parry & Rollinson, 5 to 9, Quality Court, Chancery Lane, London, W.C.2.

KATHARD. No. B674,273. Class 9. Electrical apparatus and instruments and parts thereof and fittings therefor, all being goods included in Class 9.—Electrical Supplies Co. (Manchester), Ltd., Viaduct Rd., Broad Heath, Altrincham.

CESCO. No. 678,077. Class 9. Electrical apparatus and instruments and parts thereof, all included in Class 9; and wireless and television instruments and parts thereof included in Class 9; but not including electric cigar lighters, irons, coffee makers, or wire, or any goods of the same description as any of these excluded goods.—Cesco, Ltd., 19, The Broadway, High Road, Wood Green, London, N.22.

HH (design). No. 680,247. Class 9. Electrical apparatus and instruments for the installation, distribution, switching, controlling and protection of electric circuits.—Naamlooze Vennootschap Fabriek van Electrische Apparaten Voorheen F. Hazemeijer & Co., Hengelo, Holland. Address for service c/o Pollak, Mercer & Tench, 134, Cheapside, London, E.C.2.

HEATROLA. No. B663,351. Class 11. Installations for heating, steam generating, cooking, drying, ventilating and hot water supply purposes.—Noma Electric Corporation, New York, U.S.A. Address for service, c/o Stevens, Langner, Parry & Rollinson, 5 to 9, Quality Court, Chancery Lane, London, W.C.2.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Australia.—QUEENSLAND.—26th October. City Electric Light Co., Ltd., Brisbane. Station batteries, battery chargers and associated switchgear for Bulimba "B" power station. (C.R.E. (I.B.) 60709/50. Ten/1503.)*

Bury.—4th September. Corporation. Electrical installation at Elton County Secondary School. (See this issue.)

Charlesworth (nr. Manchester).—30th August. Electric heating installation at St. John's Church. (See 18th August issue.)

Cleethorpes.—6th September. Corporation. Electrical installations in 100 dwellings on Highgate housing site. (See 18th August issue.)

Darlaston.—8th September. U.D.C. Installation of electric light and power in 145 pre-war Council houses (deposit: £2 2s). Surveyor, 49, Church Street.

Denbighshire.—Education Authority. Electric lighting installation at Llanrwst Grammar School canteen, kitchen and dining room. (See 18th August issue.)

Egypt.—7th September. Cairo Electricity and Gas Administration. Supply of twenty 150 kVA, forty 300 kVA and three 400 kVA transformers. (C.R.E. (I.B.) 61795/50. Ten/1525.)*

India.—25th September. Directorate-General of Industries and Supplies, New Delhi. Fifty-two diesel-engine driven alternators, ranging from 62.5 to 625 kVA. (C.R.E. (I.B.) 61259/50. Ten/1518.)*

25th September. Bombay Electricity Department, Government of Madhya Pradesh. Equipment for 66 kV substations. (C.R.E. (I.B.) 61357/50. Ten/1517.)*

Middlesex.—9th September. Electric lamps for twelve months from 1st November next. (See this issue.)

Newcastle-upon-Tyne. — 16th September. Education Committee. Installation of electric lighting at Benton Park Primary School. (See 18th August issue.)

New Zealand.—7th November. State Hydro-Electric Department, Wellington. One 50 MVA transformer bank and spare unit for the Roxburgh power station. (C.R.E. (I.B.) 61858/50. Ten/1540.)*

Pakistan.—1st September Director-General of Supply and Development, Karachi. Paper-insulated cables. (C.R.E. (I.B.) 61947/50. Ten/1538.)*

Salford.—18th September. City Engineer's Department. Electrical installations in four shops, four maisonettes and 259 flats. (See this issue.)

Southern Rhodesia.—1st December. Electricity Supply Commission, Salisbury. One 20,000 kW high-pressure steam turbo-alternator, with auxiliaries and accessories, for Umniati "B" power station. (C.R.E. (I.B.) 60908/50. Ten/1504.)*

20th September. Umtali Municipal Council. Copper wire. (C.R.E. (I.B.) 61803/50. Ten/1530.)* House service equipment. (C.R.E. (I.B.) 61804/50. Ten/1549.)* 18th October. L.v. substation h.r.c. switchgear. (C.R.E. (I.B.) 61802/50. Ten/1528.)* Street lighting equipment. (C.R.E. (I.B.) 61805/50. Ten/1527.)* One 50 kVA and six 150 kVA transformers. (C.R.E. (I.B.) 61800/50. Ten/1529.)*

Stanley (Co. Durham).—1st September. U.D.C. Supply of twenty reinforced concrete street lighting standards. (See this issue.)

Tangier.—3rd October. Director of State Water and Electricity Services. Two diesel-driven 4,500 kW sets. (C.R.E. (I.B.) 60486/50. Ten/501.)*

Worthing.—31st August. R.D.C. Installation of electricity in 79 pre-war houses at Lancing (deposit: £1 1s). Housing manager, 15, Mill Road.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

ORDERS PLACED

Durham.—County Council. Electrical installation at Easington Hostel (£387).—East Durham Electricals, Ltd., Shotton.

Morpeth (Northumberland).—Town Council. Electrical installations in 57 houses at Spelvit Lane.—J. & A. Oliver, Ashington.

Newcastle-upon-Tyne.—Education Committee. Installation of electric lighting in schools in place of gas:—Canning Street and Wingrove Primary.—B. French, Ltd. Elswick Road Primary.—A. F. Jemison. Ornddas Park Primary.—Robson & Colman, Ltd. Denton Road Primary.—Watson-Norie, Ltd. Royal Jubilee Primary.—Thos. G. Usher & Co. Spital Tongnes and West Jesmond Primary.—Dougal & Railton.

Northumberland. — Education Committee. Electrical work at schools:—Rothbury Thomlinson's (£280).—R. Robinson. South Gosforth County Primary (£408).—Morris & Smiles. Hexham County Primary (£443).—A. Moffett & Sons. Berwick Grammar additions (£140).—S.E. Scotland Electricity Board.

Seaham (Durham).—U.D.C. Electrical work in connection with the erection of 82 houses on the Westlea estate.—J. Calvert.

West Hartlepool.—Town Council Twenty-two lamp columns for improving the lighting in York Road, West Hartlepool.—Engineering & Lighting Equipment Co.

Installation of electricity in 20 houses at Owton Manor.—Illuminated Installations, Ltd.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ayr.—Out-patient and casualty department at Seafield Hospital; Western Regional Hospital Board, 65, Renfield Street, Glasgow.

Works extensions, McCall's Avenue; Wm. C. Gray & Sons., Ltd., Newton Carpet Works.

Birkenhead.—Twelve police houses, Prenton Road West; Edward Thomas (Construction), Ltd., 74, Woodchurch Lane.

Birmingham.—Proposed Bournville secondary technical school for boys; Martin, Martin & Ward, architects, 106, Colmore Row.

Conversion of Field House, Clent, as a residential nursery (£14,618); city engineer.

Bolton.—County secondary school at Great Lever (£500,000) and Breightmet county primary school (£98,000); borough engineer.

Flats and houses, Hawthorne Road; W. Lionel Gray (1933), Ltd., Hospital Buildings, Darley, Farnworth.

Burton-on-Trent.—Primary school, Horninglow; borough surveyor.

Cambridge.—Flats (56), Newmarket Road; borough surveyor.

Cardiff.—Works extensions for British Oxygen Co., Ltd.; E. Turner & Sons, Ltd., builders, Penarth Road.

Chelmsford.—Milk processing dairy, Coval Lane, for Co-operative Society, Ltd.; W. J. Reed, Architects' Department, 99, Leman Street, London, E.1.

Derby.—Houses (110), Mackworth estate; H. J. Warner, Ltd., Station Road Works, Mickleover.

Droylsden.—Flats (52), site off Moorside Street, for U.D.C.; F. Bradley, architect, Penny Bank Chambers, 4, Wood Street, Bolton.

Flintshire.—Horticultural centre, Celyn (£60,000); deputy county architect, Mold.

Guisborough.—Houses (100) for U.D.C.; Garbutt, Archibald and Archibald, architects, 23, Albert Road, Middlesbrough.

Hastings.—Flats (16) and 132 houses, Hollington Rectory site; borough surveyor.

Hertford.—Houses (66), Bengeo estate; Borough surveyor.

London.—CLAPHAM.—Dwellings (794), Studley Road, for Lambeth B.C.; Sir Lancelot Keay, architect, Red House, Allerton Road, Liverpool, 18.

COVENTRY STREET.—Shops, offices, newsreel cinema, etc.; E. A. Stone, architect, 20, Berkeley Street, W.1.

STRAND.—Rebuilding River Wing of Somerset House; G. E. Wallis & Sons, Ltd., 231, Strand, W.C.2.

Luton.—Houses (132), Farley Hill estate; borough engineer.

Micheldever (Hants).—Laboratory for County Roads Department (£12,000); county architect, The Castle, Winchester.

Milford Haven.—Houses (58), Observatory site; U.D.C. surveyor.

Morecambe.—Garage, stores and offices, Acre Moss Lane Depot (£25,000); borough surveyor.

Northampton.—Infants' school, Queen Eleanor Road, Far Cotton; borough architect.

Northumberland.—Fire stations at Newburn and Alnwick; county architect, County Hall, Newcastle-on-Tyne.

Development scheme at Lynemouth Colliery (2,000 houses); county planning officer, Newcastle-on-Tyne.

Norwich.—Dwellings (92), Southwell Road-Trafalgar Street, in seven groups; city architect, City Hall.

Ormskirk.—Houses (42), Scott estate; borough surveyor.

Oxford.—Workshop block for College of Further Education; city architect.

Peterborough.—Houses (86), Crown Street; city engineer.

Plymouth.—Seven blocks of three-storey houses, Whitleigh estate, and three pairs of shops with flats over, Ham estate; city architect.

Rainham.—Research block (£70,000); Murex, Ltd., Murex Works, Rainham.

Rotherham.—Secondary school, Oakwood; Henry Vale & Sons, surveyors, 21, Waterloo Road, Wolverhampton.

Sheffield.—Departmental store, High Street, for John Walsh, Ltd.; J. W. Beaumont & Sons, architects, 53, Spring Gardens, Manchester.

Acres Hill county school (£59,385); Ackroyd & Abbott, Ltd.

Smethwick.—Hamilton Road infants' school; T. Wellings & Sons, Ltd., Woodhouse estate, Tettenhall, Wolverhampton.

Stevenage.—Houses, shops and flats (about 500), Monks Wood site, for Development Corporation; chief administrative officer to the Corporation, Aston House, Aston, near Stevenage, Herts.

Sutton Coldfield.—Shops and flats, Falcon Lodge estate; borough surveyor.

Swansea.—Works, Crymlyn Burrows; Hughes Morgan & Co., Ltd., Burrows Yard, Port Tennant.

Swindon.—Hospital; Oxford Regional Hospital Board, 43, Banbury Road, Oxford.

Torquay.—Houses (70), Marldon Road; C. Bryant & Son, Ltd., builders, 65, Whitmore Road, Birmingham, 10.

Trowbridge.—Library, Polebarn Road; county architect, County Hall.

Tunbridge Wells.—Flats (48), Ramslye estate; borough surveyor.

Wakefield.—Offices and messroom, Calder Vale Road; Shell-Mex & B.P., Ltd., Shell-Mex House, Victoria Embankment, W.C.2.

West Hartlepool.—Rossmere county primary school, Brierton county secondary school, and annexe for technical college; borough architect, Municipal Buildings.

Weymouth.—Houses (86), Downclose estate; Richards (Developments), Ltd., Upwey, Dorset.

Whitley Bay.—Houses (36) on the Foxhunters' site; J. Urpeth, builder, Moorland Avenue, Bedlington Station, Northumberland.

Worthing.—Three blocks of flats, Canterbury Road; borough engineer.